# NATURAL HISTORY

OF

# *BIRDS, FISH,*

# INSECTS, AND REPTILES.

EMBELLISHED WITH

UPWARDS OF TWO HUNDRED ENGRAVINGS.

IN FIVE VOLUMES.

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# NATURAL HISTORY

# OF

# *BIRDS, FISH, REPTILES, &c.*

## THE CACHALOT, PHYSETER, or SPERMACETI WHALE, AND ITS VARIETIES.

ONE of the leading characteriſtics of this genus is a number of teeth in the under jaw, but none in the upper. It is by no means of ſuch an enormous ſize as the common whale. The tongue is ſmall, but the throat, in contradiſtinction to the former tribe, is amazingly capacious, ſo that at one gulp it can ſwallow ſhoals of the ſmaller fiſh down its enormous gullet, which has been deſcribed as capacious enough to admit an ox. Loads of fiſh, ſome eight or nine feet in length, have been found undigeſted it its ſtomach: it is therefore as deſtructive as the whale is harmleſs. The head of the whale is nearly one third the ſize of the body; but the head of the cachalot conſtitutes one half of the animal. Slenderer than the former, it is alſo more active, and proportionably depredatory. This creature received its preſent technical name from Mr. Pennant, who enumerates ſeven different ſpecies:

1. The cachalot with two fins and a black back;

2. The cachalot with two fins and a whitiſh back;

3. That with a ſpout in the neck;

4. That with a ſpout in the ſnout;

5. That with three fins and ſharp pointed teeth;

6. That with three fins and ſharp edged teeth; and

7. The cachalot with three fins and flat teeth.

The cachalot race yields a ſmaller quantity of oil than the preceding genus, which, however is amply atoned for by its affording ſo abundantly thoſe two valuable articles, ſpermaceti and ambergris.

The ignorance of the people who firſt uſed ſpermaceti gave it a name which ſeemed to expreſs its being the ſemen of the whale; but it is, in reality, no more than a preparation of the oil with which that fiſh abounds.

It is a fine, bright, white, and ſemi-pellucid ſubſtance, compoſed of a fine ſurfaracious ſubſtance, formed into oblong flakes very light, ſoft, and unctuous to the touch, inflammable, ſoluble in oil, but not in watery menſtrua; of ſcarce any ſmell when freſh and fine, and of a ſoft, agreeable, and unctuous taſte. The largeſt, firmeſt, and whiteſt flakes of it are to be choſen. It is liable to become rancid and yellowiſh in keeping; and the ſmaller fragments contract this bad quality ſooner than the larger.

The firſt knowledge the world ſeems to have had of ſpermaceti, was the finding it ſwimming on the ſurface of the water in the northern ſeas: and we are not to wonder that people who knew no more of its origin than what they were informed of by thoſe who found it ſo floating on the ſea, referred it to the mineral claſs, ſuppoſing it to be bitumen formed in the bowels of the earth, and thrown up from the bottom of the ocean, as was the opinion of Schroder, and others of his time. It was ſoon after diſcovered however, that the head of a peculiar ſpecies of whale afforded a fatty ſubſtance, which, when boiled, and properly prepared, was analogous to this. And here it was ſoon deduced, that the maſſes of it firſt found were of the ſame origin; that they had been formerly an oily matter in this fiſh, which, getting looſe, on the periſhing of the dead carcaſe, or by any other means, had been waſhed and bleached by the ſalt water, and the ſun, into the form in which it was then found. The opinion of its being the ſperm, or ſemen, of the whale, was about as early as the firſt diſcovery that it belonged to that animal, and ſeems to have been formed merely on account of its whiteneſs.

The ſpermaceti of the ſhops was firſt made from the head of this fiſh; the oil obtained from its brain, and the diploe of the cranium, furniſhing all that we had of it; and hence the conſiderable price it was then kept at. It was ſome time after found out, however, that any whale oil would do as well as this, which occaſioned the price to fall conſiderably. At preſent it is made in England from whale oil of any kind, the ſettling of our oilmen's large veſſels, particularly, which are boiled with a quantum of German pot-aſh, or pearl-aſhes, till white and firm; and after ſeveral other meltings, and a thorough ſeparation of what ſaline particles might have got into the matter, it is, when cold, cut out with knives into the flakes we ſee it in. The proceſs is eaſy, but it requires care, and nice inſpection towards the end: if not enough boiled, it is apt to turn yellow, and ſoon grow rancid.

Spermaceti is, therefore, oil of the animal kind, rendered very ſweet, and fit for internal uſe. Its virtues are emollient and pectoral; it is good in coughs, and other diſorders of the breaſt; and excellent in internal applications, ſuch as liniments and the like, it readily diſſolves in oil, or other fatty ſubſtances, for the latter purpoſes; and for the former, it blends with the yolk of an egg, and after that mixes with an aqueous fluid, and makes a pleaſant emulſion.

But the ſpermaceti, as naturally formed, is undoubtedly the brain of the animal. A thick covering of fat lies immediately under the ſkin of the head; beneath this fat, there is another thick ſkin, which inſtead of a bony ſkull, ſerves for the covering and defence of the animal's brain. The firſt cavity of the brain is filled with that ſpermaceti which is ſuppoſed of the greateſt purity and higheſt value. Seven barrels of the cleareſt ſpermaceti is generally the produce of this cavity, which, when thrown upon water, coagulates like cheeſe. There is alſo another chamber or cavity, juſt over the gullet, about ſeven feet high, that affords a conſiderable quantity, tho' of leſs value than the firſt. It is obſervable, that in proportion as the oily ſubſtance is drawn from this part, it fills again from every part of the body. The ſpinal marrow alſo affords no inconſiderable quantity. This ſubſtance has become not more an article of manufacture than a medicine; and of which candles, cheaper though not leſs elegant than wax, are plentifully made.

Ambergris, which is now alſo known to be the production of the cachalot whale, is a ſolid, opake, aſh-coloured, fatty inflammable ſubſtance, variegated like marble, remarkably light, rugged and uneven in its ſurface, and has a fragrant odour when heated.

It is found ſwimming upon the ſea, or the ſea coaſt, or in the ſand near the ſea coaſt; eſpecially in the Atlantic Ocean, on the ſea coaſt of Braſil, and that of Madagaſcar; on the coaſt of Africa, of the Eaſt-Indies, China, Japan, and Molucco iſlands; but moſt of the ambergris which is brought to England comes from the Bahama iſlands, from Providence, &c.

where it is found on the coaſt. It is alſo ſometimes found in the abdomen of whales by the whale fiſhermen, always in lumps of various ſhapes and ſizes, weighing from half an ounce to a hundred or more pounds. The piece which the Dutch Eaſt India company brought from the King of Tydor, weighed 182 pounds. An American fiſherman from Antigua found, ſome years ago, about 52 leagues ſouth-eaſt from the Windward Iſlands, a piece of ambergrin in a whale, which weighed about 130 pounds, and ſold for 500l. ſterling.

The moſt ſatisfactory account of the real origis of ambergris, is that given by Dr. Swediar, in the 73d volume of Philoſophical Tranſactions, art. 15. According to the beſt information he could obtain from ſeveral of the moſt intelligent perſons employed in the ſpermaceti whale-fiſhery ; and in procuring and ſelling ambergris, it appears, that this ſubſtance is ſometimes found in the belly of the whale, but that in a particular ſpecies only, which is called the *ſpermaceti whale*.

The New England fiſhermen, according to their account, have long known that ambergris is to be found in the ſpermaceti whale, and they are ſo convinced of this fact, that, whenever they hear of a place where ambergris is found, they always conclude the ſeas in that part are frequented by this ſpecies of whale.

The perſons who are employed in the ſpermaceti whale fiſhery, confine their views to the great headed whale, or *macrocephalus*. Whenever they hook a ſpermaceti whale, they obſerve, that it conſtantly not only vomits whatever it has in its ſtomach, but alſo commonly diſcharges its fæces at the ſame time; and if the latter circumſtance takes place, they are generally diſappointed in finding ambergris in its belly. But whenever they diſcover a ſpermaceti whale, male or female, which ſeems torbid and ſickly, they are always pretty ſure to find ambergris, as the whale in this ſtate ſeldom voids its fæces upon being hooked. They likewiſe meet with it in the dead ſpermaceti whales, which they ſometimes find floating on the ſea. It is obſerved alſo, that the whale, in which they find ambergris, often has a morbid protuberance; or, as they expreſs it a kind of gathering in the lower part of its belly, in which, if cut open, ambergris is found. It is obſerved, that all thoſe whales, in whoſe bowels ambergris is found, ſeem not torpid and ſick, but are alſo conſtantly leaner than others; ſo that if we may judge from the conſtant union of theſe two circumſtances, it would ſeem that a larger collection of ambergris in the belly of the whale is a ſource of diſeaſe, and probably ſometimes the cauſe of its death. As ſoon as they hook a whale of this deſcription, torpid, ſickly, emaciated, or one that does not dung on being hooked, they immediately either cut up the above-mentioned protuberance, if there be any, or they rip open its bowels from the orifice of the anus, and find the ambergris ſometimes in one, ſometimes in different lumps, of generally from ſix to twelve and more inches in diameter, and from one pound to twenty or thirty pounds in weight, at the diſtance of two, but more frequently of about ſix or ſeven feet from the anus, and never higher up in the inteſtinal canal, which, according to their deſcription is, in all probability, the *inteſtinum cæcum*, hitherto miſtaken for a peculiar bag made by nature for the ſecretion and collection of this ſingular ſubſtance. That the part they cut open to come at the ambergris is no higher than the inteſtinal canal is certain, becauſe they conſtantly begin their inciſion at the anus, and find the cavity every where filled up with the fæces of the whale, which from their colour and ſmell it is impoſſible for them to miſtake. The ambergris found in the inteſtinal canal is not ſo hard as that which is found on the ſea or ſea-coaſt, but ſoon grows hard in the air: when firſt taken out it has nearly the ſame colour, and the ſame diſagreeable ſmell, though not ſo ſtrong as the more liquid dung of the whale has; but on expoſing it to the air, it by degrees not only grows greyiſh, and its ſurface is covered by a greyiſh duſt like old chocolate, but it alſo loſes its diſagreeable ſmell, and when kept for a certain length of time, acquires the peculiar odour which is ſo agreeable to moſt people.

The gentlemen the Doctor converſed with confeſſed, that if they knew not from experience that ambergris thus found will in time acquire the above-mentioned qualities, they would by no means be able to diſtinguiſh ambergris from hard indurated fæces. This is ſo true, that whenever a whale voids its fæces upon being hooked, they look carefully to ſee if they cannot diſcover in the more liquid excrements, (of which the whale diſcharges ſeveral barrels) ſome pieces floating on the ſea, of a more compact ſubſtance than the reſt; theſe they take up and waſh, knowing them to be ambergris.

All ambergris, when taken out of whales, has very nearly the ſame ſmell as the liquid excrements of the animal, as well as the ſame blackiſh colour: and it is a matter of fact, that after being taken out and kept in the air, all ambergris grows not only harder and whiter, but alſo loſes, by degrees, its ſmell, and aſſumes ſuch an agreeable one, as that in general has which is found ſwimming upon the ſea; therefore the goodneſs of ambergris ſeems much to depend upon its age; and the only reaſon why ambergris found floating on the ſea is of better qualities, is its greater age and longer expoſure to the air. It is more frequently found in males than females—the pieces in the latter being generally ſmaller, and the quality inferior.

It is well known that the ſepia octopodia, or cuttle-fiſh, is the conſtant and natural food of the ſpermaceti whale, or phyſeter macrocephalus. Of this the fiſhers are ſo well perſuaded, that whenever they diſcover any recent relics of it ſwimming on the ſea, they conclude that a whale of this kind is, or has been, in that part. Another circumſtance which corroborates the fact is, that the ſpermaceti whale on being hooked generally vomits up ſome remains of the ſepia. Hence it is eaſy to account for the many beaks, or pieces of beaks, of the ſepia found in all ambergris. The beak of the ſepia is a black horny ſubſtance, and therefore paſſes undigeſted through the ſtomach into the inteſtinal canal, where it is mixed with the fæces; after which it is either evacuated with them, or if theſe latter be preternaturally retained, forms concretions with them, which render the animal ſick and torpid, and produce an obſtipation, which ends either in an abſceſs of the abdomen, as has been frequently obſerved, or becomes fatal to the animal; whence in both the caſes on the burſting of its belly, that hardened ſubſtance, known by the name of *ambergris*, is found ſwimming on the ſea, or thrown upon the ſea coaſt.

From the preceding account, and his having conſtantly found the above-mentioned beaks of the ſepia in all pieces of ambergris of any conſiderable ſize, Dr. Swediar concludes, with great probability, that all ambergris is generated in the bowels of the Phyſeter macrocephalus, or ſpermaceti whale; and there mixed with the beaks of the ſepia octopodia, which is the principal food of that whale. He therefore defines ambergris to be the preter-naturally hardened dung, or fæces, of the phyſeter macrocephalus, mixed with ſome indigeſtible relics of its food.

The uſe of ambergris in Europe is now nearly confined to perfumery, though it has formerly been recommended in medicine by many eminent phyſicians, yet perhaps in quantities too ſmall to produce any ſenſible effect.

In Aſia and part of Africa, ambergris is not only uſed as a medicine, and as a perfume, but conſiderable uſe is alſo made of it in cookery, by adding it to ſeveral diſhes as a ſpice.

By the Pilgrims who frequent Mecca, it is uſed in fumigations, in the ſame manner as frankincenſe is uſed in Catholic countries. The Turks made uſe of it as an aphrodiſiac; and among the Engliſh perfumers it is applied to a variety of purpoſes.

One thing is very remarkable, that this drug, which is the moſt ſweet of all the perfumes, ſhould be capable of being imitated in ſmell, by a preparation of the moſt odious of all ſtinks. Mr. Hornbey found, that a veſſel in which he had made a long digeſtion of the human fæces acquired a very ſtrong and perfect ſmell of ambergris,

bergris, inſomuch that any one would have thought a great quantity of eſſence of ambergris had been made in it. The perfume was ſo ſtrong and offenſive, that the veſſel was obliged to be removed out of the elaboratory.

To view theſe animals in a commercial light, we muſt obſerve, that the Engliſh were ſo late as the year 1755 before they engaged in the whale fiery. This appears very ſtrange;—for by the account Octher gives of his travels to King Alfred, almoſt ſeven hundred years before that period, (in Hackluyt's collection of voyages) it is evident that he made that monarch acquainted with the Norwegians practiſing the whale fiſhery; but it ſeems all memory of that gainful employ, as well as of that able voyager Octher, and all his important diſcoveries in the North, were loſt for near ſeven centuries.

It was carried on by the Biſcayeneers long before we attempted the trade; and that for the ſake, not only of the oil, but alſo of the whalebone, which they ſeem to have long trafficked in. The earlieſt notice we find of that article in our trade is by Hackluyt, who ſays it was brought from the Bay of St. Laurence by an Engliſh ſhip that went there for the *barbes* and *fynnes* of whales and train oil, 1594, and who found there ſeven or eight hundred whale *fynnes*, part of the cargo of two great Biſcayer ſhips, that had been wrecked there three years before. Previous to that, the ladies' ſtays muſt have been made of ſplit cane, or ſome tough wood, as Mr. Anderſon obſerves, in his dictionary of commerce; it being certain that the whale fiſhery was carried on for the ſake of the oil, long before the diſcovery of the uſe of whalebone.

The great reſort of theſe animals was found to be on the inhoſpitable ſhores of Spitzbergen, and the European ſhips made that place the principal fiſhery, and for numbers of years were very ſucceſsful: the Engliſh commenced that buſineſs about the year 1598, and the town of Hull had the honor of firſt attempting that profitable branch of trade. At preſent it ſeems to be on the decline, the quantity of fiſh being greatly reduced by the conſtant capture for ſuch a vaſt length of time: ſome recent accounts inform us, that the fiſhermen, from a defect of whales, apply themſelves to ſeal fiſhing, from which animals they extract oil. This, it is apprehended will not be of long continuance; for theſe ſhy and timid creatures will ſoon be induced to quit thoſe ſhores, by being perpetually harraſſed as the morſe or walrus has already done. It is alſo ſaid, that the poor natives of Greenland begin even now to ſuffer from the decreaſe of the ſeal in their ſeas—it being their principal ſubſiſtence, ſo that ſhould it totally deſert the coaſt, that miſerable country would be in danger of periſhing through want.

In old times, it appears that the whale was never taken on our coaſts, but when it was accidentally thrown aſhore: it was then deemed a royal fiſh, and the King and Queen divided the ſpoil;---the King aſſerted his right to the head, and her Majeſty to the tail.

The art of taking whales is not only ſo generally known as to exclude it from a ſhare of this work, but is indeed foreign to the deſign. The fiſhery begins in May and generally concludes with the end of Auguſt.—The methods of catching has been improved by time, and the uſe of the harpoon has given way to machines more powerful and more certain. Better modes have been diſcovered for extracting the oil, and better inſtruments for cutting up the animal, than were uſed in the early fiſheries. To ſome nations, the fleſh of the whale is a dainty; the French ſeamen now and then

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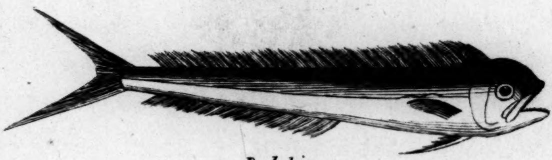
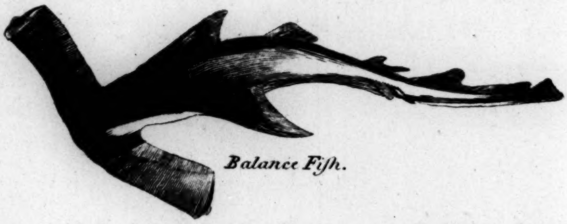
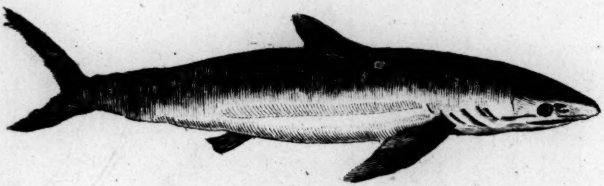


*Dolphin.*



*Balance Fiſh.*



*Shark.*

then dreſs it for their diet at ſea, and the natives of Greenland, as well as the ſavage inhabitants of countries near the South Pole, not only uſe it as their common food, but are fond of it to diſtraction, drinking the oil as a firſt rate delicacy. Jacobſon, the naturaliſt of the Faroe iſland, after mentioning that his countrymen live a part of the year upon ſalted gulls, tells us alſo, that they are very fond of ſalted whale's fleſh. The fat of the head they ſeaſon with bay ſalt, and then hang it up to dry in the chimney. He thinks it taſtes as well as fat bacon; and the lean which they boil, is in his opinion not inferior to beef.

## THE DOLPHIN, PORPESSE, GRAMPUS, AND THEIR VARIETIES.

THE natural ſhape of the Dolphin is almoſt ſtraight, the back being very ſlightly incurvated, and the body ſlender; the noſe is long, narrow, and pointed, not much unlike the beak of ſome birds. It is clearly characterized from the preceding genera by having teeth in both jaws, namely twenty-one in the upper, and nineteen in the lower jaw; ſomewhat above an inch long, conic at the upper end, ſharp pointed, and bending a little in. They are placed at a ſmall diſtance from each other; ſo that when the mouth is ſhut, the teeth of both jaws lock into each other: the ſpout-hole is placed in the middle of the head; the tail is ſemi-lunar; the ſkin is ſmooth, the colour of the back and ſides duſky, the belly whitiſh, it ſwims with great ſwiftneſs, and its prey is fiſh.

The Dolphin has a ſtrong reſemblance to the porpeſſe, except that its ſnout is longer and more pointed. All theſe ſpecies have fins on the back; very large heads like the reſt of the whale kind; and reſemble each other in their appetites, their manners, and conformation, being equally voracious, active and roving. No fiſh could eſcape them, but from the aukward poſition of their mouth, which is placed in a manner under the head; and their own agility is ſo great as to prevent them from being often taken. They ſeldom remain a moment above water though their too eager purſuit after prey ſometimes expoſes them to danger; a ſhoal of herrings often allures them out of their depth, and they continue to flounder in the ſhallows till knocked on the head, or the returning tide comes to their relief. And when taken they ſometimes have a plaintive moan, with which they continue to expreſs their pain till they expire.

Hiſtorians and Philoſophers ſeem to have contended who ſhould invent moſt fables concerning this fiſh ;---it was conſecrated to the Gods,---was celebrated in the earlieſt time for its fondneſs of the human race,---was honoured by the title of the *ſacred* fiſh, and diſtinguiſhed by thoſe of *boy-loving* and *philanthropiſt.* It gave riſe to a long train of inventions, proofs of the credulity and ignorance of the times. Ariſtotle ſteers the cleareſt of all the ancients from theſe fables; and gives, in general, a faithful hiſtory of the animal; but the elder Pliny and others ſet no bounds to their belief of the tales related of this fiſh's attachment to mankind. Scarce an accident could happen at ſea, but the dolphin offered himſelf to convey to ſhore. Arion, the muſician, when flung into the ocean by the pirates, who had plundered him, is received and ſaved by this benevolent fiſh: and of equal notoriety is the ſtory of the boy, who daily took an airing into the midſt of the ſea upon the dolphin's back, and returned in ſafety.

In leaping out of the water, this fiſh aſſumes a temporary curvature that is not natural to them; but which the painters and poets, who perhaps on this occaſion borrowed from each other, have conſtantly given them; and which has indeed become too general an error.

By what means this fiſh became the favourite of antiquity, it is not eaſy to conceive; its ſuppoſed attachment to the human race, in preference to any of the cetaceous tribe, has been detected and juſtly ridiculed; for had it poſſeſſed any ſuch peculiarities, they muſt long ſince have been aſcertained. Their appearance too, ſo far from being prepoſſeſſing, or received as a favourable omen, is conſidered by ſailors as a very unfavourable one, and their gambols as an admonition to prepare for a ſtorm.

The dolphin was formerly reckoned a delicacy: Dr. Caius ſays, that one which was taken in his time (in the reign of Elizabeth) was thought a preſent worthy the Duke of Norfolk, who diſtributed part of it among his friends. It was roaſted and dreſſed with porpeſſe ſauce, made of crumbs of fine white bread, with vinegar and ſugar.

It may be neceſſary to obſerve, that this ſpecies of dolphin muſt not be confounded with that to which ſeamen give the ſame name, but which is quite a different fiſh, and will afterwards be deſcribed among the ſpinous claſs, under its proper title.

The *phocaena*, or *porpeſſe*, is found in vaſt multitudes in all parts of the Britiſh ſeas. Their bodies are thick towards the head, but grow ſlender towards the tail, forming the figure of a cone. In each jaw are 48 teeth, ſmall, ſharp-pointed, and moveable; and ſo placed that the teeth of one jaw lock into thoſe of the other. The eyes are ſmall, as is the ſpout-hole at the top of the head. In colours the back is black, and the belly whitiſh---but they ſometimes vary. In the river St. Laurence there is a white kind.---Dr. Borſale in his voyage to the Scilly iſles, obſerved a ſmall ſpecies of cetaceous fiſh, which he calls *thornbacks*, from their broad and ſharp fin on the back. Some of theſe were brown, ſome quite white, others ſpotted; but whether they were only a variety of this fiſh, or whether they were ſmall grampuſſes, which are alſo ſpotted, we cannot determine. The porpeſſe is remarkable for the vaſt quantity of fat or lard that ſurrounds its body, and yields an excellent oil. The noſe being furniſhed with very ſtrong muſcles, that enable it to turn up the ſand for eels and ſea worms, it is thence in many places called the ſea-hog: and the animal ſleeps with its ſnout above the water.

At the ſeaſon when the fiſh of paſſage appear, as mackerel, herring, pilchards, and ſalmon, the porpeſſes ſwarm, and purſue them even up the rivers with great avidity, following their game like a pack of hounds. In Cornwall during the pilchard ſeaſon, they often do much miſchief, by an univerſal laceration of the nets, and interrupting the fiſhery. In ſome places they almoſt darken the ſea, as they riſe above water to take breath, which they do very frequently.

The porpeſſe was a royal diſh even ſo late as the reign of Henry VIII. as appears from the houſehold book of that Prince, quoted in the third volume of the archæologia; and muſt, from its ſize, have held a reſpectable ſituation at the princely board; and it continued in vogue even in the reign of Elizabeth.

In men there are clearly many palates and taſtes as well as minds and opinions; and the taſtes of people of the ſame country vary much in different ages. Stinking fiſh is a luxurious food to the negroes of the coaſt of Guinea; the ſtranding of a whale on Fox iſlands is ſuch a happy event, that the inhabitants immediately collect round the oily animal, and with ſundry tokens of joy and exultation, devour the beſt parts of it before they ſeparate; and in England we ſee that what two hundred and fifty years ago was a feaſt for a King, is now abhorred by a peaſant. But would not our anceſtors have had ſome cauſe for aſtoniſhment, could they have foreſeen that there would be annually a large importation of an amphibious creature from the Eaſt and Weſt Indies to qualify the taſte of the Britiſh epicures of the eighteenth century? diſguſting is the porpeſſe to us; and exquiſite is the taſte of calipaſh and calipee;---yet might not this to our eighth Henry, and to thoſe of his courtiers who were no leſs *bon-vivans* than their ſovereign, be a fiſh and a diſh equally monſtrous?

Such is the violence of the porpeſſe, in purſuit of its prey, that it will follow a ſhoal of ſmall fiſh up a freſh water river, from whence it finds a difficulty to return. Theſe creatures have been often taken in the river Thames, both above and below London-bridge; and it is curious to obſerve with what dexterity they avoid their purſuers, and how momentarily they recover their breath above the water. It is uſual to ſpread four or five boats over the part of the river where they are ſeen, and to fire at them the inſtant they riſe.

The porpeſſe yields no inconſiderable quantity of oil, and therefore renders its capture an object of conſideration. The lean of the young ones is alſo ſaid to be well taſted, and not unlike veal. They go with young ten months, ſeldom bring forth more than one at a time, and generally in the ſummer: from the *ova* found in this fiſh, a kind of caviare is made, which is eaten as a ſauce, or with bread. It is conjectured that they live about thirty years.

The *Orca*, or *Grampus* was very juſtly called by Pliny "an immenſe heap of fleſh armed with dreadful teeth." It is ſaid to be an enemy to the whale, on which it will faſten like a dog upon a bull, till the animal roars with pain; and it is ſo voracious as not even to ſpare the porpeſſe, though of ſo kindred a nature. They are found from 15 feet long to 25; and ſo thick in proportion to their length, that one of 18 feet long is, in the thickeſt part, more than 10 feet diameter. There are 30 teeth in each jaw ; thoſe before are blunt, round, and ſlender ; the fartheſt ſharp and thick, and which look into each other like thoſe of the porpeſſe. The ſpout hole is in the top of the neck ; the colour of the back is black, but on each ſhoulder is a large white ſpot ; the ſides marbled black and white, the belly of a ſnowy whiteneſs. They ſeldom appear on our coaſts, but are found in great quantities off the North Cape in Norway, whence they are termed North Capers.

The *Beluga of the ſea* is from 12 to 18 feet in length, has a ſhort head, blunt noſe, very minute eyes, and a ſmall mouth, with 36 ſhort blunt teeth ; the pectoral fins nearly of an oval form ; and beneath the ſkin may be felt the bones of five fingers, which terminate at the edge of the fin in five very ſenſible projections. The tail is divided into two lobes, which lie horizontally, but do not fork, except a little at the baſe, and it has no dorſal fin. In ſwimming, this fiſh bends its tail under it like a lobſter, and works it with ſuch force as to dart along with the rapidity of an arrow.

This fiſh is common in all the arctic ſeas, and forms an article of commerce, being taken on account of its blubber. There are fiſheries for them and the porpeſſe in the river St. Laurence:—a conſiderable quantity of oil is extracted from them; and of their ſkin is made a ſort of morocco leather, thin, yet ſtrong enough to reſiſt a muſket ball. They are uſually caught in nets, but are ſometimes harpooned. They bring only one young at a time, which is duſky, but grows white in proportion to its age, the change firſt commencing on the belly. They are apt to follow boats, as if they were tamed; and appear extremely beautiful, by reaſon of their reſplendent whiteneſs.

## OF CARTILAGINOUS FISH IN GENERAL.

CARTILAGINOUS is a title given to all thoſe fiſh, the muſcles of which are ſupported by cartilages or griſtles inſtead of bones.

A certain duplicity of character marks this claſs in every point of view; and which forms one of the ſingular ſhades that compleat the imperceptible gradations of nature.

Cetaceous fiſh approach the neareſt to quadrupeds as well in their conformation as in their manners; their bones are thick, white, and filled with marrow; but fiſh of the cartilaginous kinds have their bones always ſoft and yielding; and uninfluenced by the common effects of age, which, while it hardens the bones of the animals, rather contributes to ſoften theirs. The ſize of all bony fiſh is ſuppoſed to increaſe with age, though certainly within a limited degree; but from the pliability of the catilaginous ſubſtitute in this tribe it muſt be highly difficult to place bounds to their dimenſions, or not to ſuppoſe that they may increaſe in bulk until the termination of their exiſtence.

Cartilaginous fiſh unite in their formation ſeveral leading properties of the other two tribes: Like the cetaceous, they have lungs; and like the ſpinous they have gills, and a heart without a partition: thus they poſſeſs a two-fold manner of breathing, ſometimes by their lungs, and ſometimes by their gills; by the impulſe of the water on which their cold red blood is circulated. And this double capacity of breathing in cartilaginous fiſh, is one of the moſt remarkable features in the hiſtory of nature; as they on account of its blubber. There are fiſheries for them and the porpeſſe in the river St. Laurence:—a conſiderable quantity of oil is extracted from them; and of their ſkin is made a ſort of morocco leather, thin, yet ſtrong enough to reſiſt a muſket ball. They are uſually caught in nets, but are ſometimes harpooned. They bring only one young at a time, which is duſky, but grows white in proportion to its age, the change firſt commencing on the belly. They are apt to follow boats, as if they were tamed; and appear extremely beautiful, by reaſon of their reſplendent whiteneſs.

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The apertures by which they breathe are variouſly placed: the ſhark has them in the ſides of his head, the pipe fiſh on the top; and the flat-fiſh generally beneath. The gills are affixed to theſe apertures, but "without any bone to open and ſhut them,"—a circumſtance that eſſentially diſtinguiſhes the cartilaginous from the ſpinous claſs of fiſh, however great the reſemblance in other reſpects. From the gills are cylindrical ducts, running to the lungs, and which are ſuppoſed to convey the air that gives play to the organs; but as the gills want the pulmonary vein and artery, they are ſuppoſed to be ineffectual for ſupplying the ſame offices as in quadrupeds; the heart, alſo, having but one valve muſt preclude the blood from that double circulation which obtains in the cetaceous kind.

This tribe is evidently poſſeſſed of certain ſuperior advantages to both the cetaceous and ſpinous; and is enabled to live a much longer time out of the water than thoſe whoſe gills are more ſimple; they can venture their heads above the deep, and continue for hours out of their native element, as we experience in the ſhark and ray, which can live ſome hours after being taken, though the ſpinous herring or mackerel expire in a few minutes. They alſo poſſeſs an advantage over the cetaceous fiſh, in being able to remain continually under water without ever taking breath.

The cartilaginous like the cetaceous fiſh, are ſaid to have their amorous intercourſes *more humano*, in which ſituation they are often diſcovered; this peculiarity however diſtinguiſhes them, that the male poſſeſſes two inſtruments of generation. They generally chuſe colder ſeaſons and ſituations for propagating their kind, than other fiſh, and many of them bring forth in the midſt of winter.

Though ſome of theſe fiſh bring forth their young alive, and ſome bring forth eggs, which are afterwards brought to maturity, yet the manner of geſtation is nearly the ſame in all; for upon diſſection, it is uniformly found that the young, while in the body continue in the egg until a very little time before they are excluded. Quadrupeds, and the cetaceous tribe, are excluded from the ovum in a ſhort period after their firſt conception, and continue in the womb ſeveral months after:—but cartilaginous fiſh may properly be ſaid to hatch within their bodies, where the young remains in the egg ſtate for weeks together ; and the eggs are united by a membrane, from which, when the fœtus gets free, it continues but a very ſhort time till it delivers itſelf from its confinement in the womb.

Of thoſe genera which bring forth their young alive, may be ranked the ſhark, and the ray kinds : while the ſturgeon and many of the ſlender ſhaped ſorts exclude their progeny in the ſtate of eggs, before the animal is come to its ſtate of diſengaging. The eggs themſelves conſiſt of a white and yolk ; but the ſubſtance that correſponds with the ſhell in the ærial tribe may aptly enough be compared to horn.

Such are the leading characteriſtics of cartilaginous fiſh : and we may obſerve that there is very little difference between the *viviparous* and the *oviparous* kinds :—that the one hatch their eggs in the womb, and the young are ſoon excluded after incubation :—the others exclude their eggs before hatching, and leave the future care of their offspring to time and the operations of nature.

Cartilaginous fiſh, of all others, abound with the greateſt variety of ill-formed and miſhapen animals: it might be unphiloſophical to call them the claſs of monſters; though in fact they exhibit a variety of ſhapeleſs beings, the deviations of which from the uſual form of fiſh, Goldſmith very elegantly obſerves, "are beyond the power of words to deſcribe, and almoſt of the pencil to draw."

Nature ſeems to have made a four-fold diviſion of this claſs, whoſe arrangement we ſhall endeavour as nearly as we can to follow,—pointing out the moſt ſtriking peculiarities of each.

The *firſt diviſion* is that of the ſhark kind, with a body growing leſs towards the tail; a rough ſkin, with the mouth placed far beneath the end of the noſe; five apertures on the ſides of the neck for breathing; and the upper part of the tail longer than the lower.

The *ſecond diviſion* comprehends the ſturgeon, and its varieties.

The *third diviſion* is that of flat-fiſh, whoſe broad, flat, thin ſhape is ſufficiently capable of diſtinguiſhing them from all others of the kind. The ſcate, the torpedo, the ray, &c. are placed in this tribe; and all theſe may be eaſily diſtinguiſhed from ſpinous flat-fiſh, by the holes through which they breathe, which in this kind are five on each ſide, and are not covered by any bone.

The ſlender, ſnake-ſhaped kind, ſuch as the lamprey, &c. conſtitute the *fourth diviſion.*

To theſe may be added an anomalous catalogue, compriſing ſeveral fiſh, whoſe figures and natures will not aſſimilate to any thing of regularity; yet whoſe formation and powers have ſomething deſerving of notice and record. A deſcription of the lump-fiſh, the ſun-fiſh, the fiſhing-frog, chimera, &c. muſt compenſate for the want of their particular hiſtory.

## OF THE SHARK AND ITS AFFINITIES.

THIS tremendous and voracious animal may juſtly enough rank next to the whale in magnitude, as it is often found near thirty feet in length, and of correſponding weight and bulk. Its mouth and throat enormouſly wide, and capable of admitting a human carcaſe; which, we are told have been repeatedly found in their bellies. His head is large and flatted; his ſnout is long, and the eyes large and goggling, projecting in ſuch a manner as to enable him to behold his prey on every ſide. But the teeth are the moſt formidable part of his compoſition; they conſiſt of ſix rows, amounting to one hundred and forty four in number, hard, ſharp-pointed, and wedge-like in their form; and the creature is poſſeſſed of the ſingular power of erecting or depreſſing them at pleaſure. They lay flat in his mouth when at reſt, but by the help of a ſet of muſcles he is enabledto erect them when he wiſhes to ſeize his prey; on which he can inflict at once an hundred wounds.

Of all the inhabitants of the deep, the ſhark is certainly the fierceſt; his aſpect is peculiarly expreſſive of the malignity of his character; he is dreaded by the leſſer tribes, and is ſcarcely leſs obnoxious to thoſe apparently more powerful; for he ſurpaſſes the whale in ſtrength and celerity not more than he exceeds all the reſt in his inſatiable appetites. His fins are larger in proportion than thoſe of moſt fiſh; and his ſkin is rough, hard, and prickly, and of which ſhagreen is made for various purpoſes. His powers of deſtruction are only counterbalanced by the difficulty he meets with in ſeizing his prey; for his upper jaw projects ſo far over the lower, that he is obliged to turn on one ſide in order to accompliſh his purpoſe; and thus afford his affrighted victims the only probability of eſcape.

It has been obſerved by Mr. Pennant, that the female is larger than the male in this tribe; a circumſtance ſtrongly characteriſtic of their nature, and forming a ſtriking agreement between them and birds of prey. But we cannot

not give ſo much confidence to the aſſertions made in regard to the fecundity of theſe animals, as it militates againſt the obſerved rules of nature: though Belonius aſſures us that he ſaw a female ſhark produce *eleven* live young ones at a time.

However formidable this creature may be when living, he is of equally little uſe when dead. The negroes are ſaid to be fond of the fleſh, which is nevertheleſs very tough and undigeſtible; the liver affords a few quarts of oil; and the ſkin, as we have noticed, is, though with great labour, poliſhed into ſhagreen.

Among its ſingularities may be reckoned its enmity to man, or rather its love of human fleſh; which when it has once taſted, it never deſiſts from haunting thoſe places where it expects the return of the prey; along the coaſts of Africa, where theſe animals are found in great abundance, numbers of the negroes, who, for various purpoſes, are obliged to frequent theſe waters are ſeized and devoured by them every year; and it is added, that they manifeſt a preference to the fleſh of the black men. But though the ſhark may be called a common enemy, he has no oppoſition but from the human race, who have contrived different methods to deſtroy him. The inſtance of the *Remora*, or Sucking fiſh, might perhaps be oppoſed to this remark, were we convinced that the remora attends this monſter for any hoſtile purpoſe.

The ſhark often falls a victim to his own rapacity, by means of the ſtratagems employed to take him: the method of doing which with our Engliſh ſailors is to bait a large hook with a piece of beef or pork, which is thrown into the ſea by a ſtrong cord ſtrengthened near the hook by an iron chain. Without this precaution the ſhark would quickly bite the cord in two, and ſet himſelf at liberty. The ſtruggle with temptation, even when this voracious animal is not preſſed by the call of appetite, is amuſing to obſerve. He approaches, examines, and ſwims round it: ſeems for a while to neglect it, as apprehenſive of the deluſion; but his voracity encreaſing, he returns as if ready to ſeize it, but apprehenſion again drives him back; thus like a youthful ſinner, he keeps agitated between deſire and fear, while the ſailors continue to divert themſelves with his contending paſſions, till they make a pretence of drawing the bait away, when propelled by every appetite at once, he darts rapidly at the bate, and makes one ravenous gulp of it, hook and all.

When the hook is lodged in his maw, his efforts are moſt ſtrenuouſly, though vainly, exerted to get free: he endeavours to cut the chain with his teeth; he labours with all his force to break the line; and his exertions to diſgorge the hook, almoſt turn his ſtomach inſide out; until enfeebled by unſucceſsful attempts, and quite exhauſted of his ſtrength, he permits the ſailors to drag him out of his native element, and diſpatch him, which is done by repeated and ſevere blows on the head.

But in dragging him on ſhip-board, much caution is neceſſary; and much difficulty and danger is frequently experienced: for in the agonies of death he is terrible, and ſtruggles powerfully with his executioners: his head and tail are ſecured and faſtened at the ſame time; but the latter is afterwards frequently cut off with an axe, to prevent his flouncing, the conſequence of which might be highly dangerous. And ſuch is the degree of vitality, or ſtrength of the vital principle in the ſhark, that he is killed with more difficulty than almoſt any other animal in the world: nay, when cut in pieces, the muſcles ſtill preſerve their motion, and vibrate for minutes after being ſeparated from the body.

The African negroes are ſaid to take a bolder and more dangerous method of deſtroying this terrible enemy. With no other inſtrument than a long knife, the negro plunges into the water, when he ſees the ſhark watching for his prey, and boldly ſwims forward to meet the fiſh, who ſuffers his antagoniſt to approach; but on turning on his ſide to meet the aggreſſor, the negro, attentive to that opportunity, plunges his knife into the fiſh's belly, and purſues his blows with ſuch ſucceſs, that he ſoon deſtroys the ravenous tyrant, who afterwards becomes a noble feaſt for the adjacent neighbourhood.

Nothing that has life is ever rejected by this rapacious animal; but, as we have obſerved, human fleſh ſeems to be his peculiar gratification, and to afford him the higheſt reliſh:—of his depredations of this nature we have many inſtances related by different writers. The ſtory of Mr. Brooke Watſon, an alderman of London, who in his youth had his leg ſnapped off by one of theſe watery depredators, is generally known.

Mr. Pennant tells us, that the maſter of a Guinea ſhip, finding a rage for ſuicide prevail among his ſlaves, from a notion entertained by the unhappy creatures, that after death they ſhould be reſtored again to their family, friends, and country; to convince, that, at leaſt, ſome diſgrace ſhould attend them here, he ordered one of their dead bodies to be tied by the heels to a rope, and ſo let down to the ſea; and though it was drawn up again with great ſwiftneſs, yet in that ſhort ſpace of time, the ſharks had bitten off all but the feet.

Dr. Goldſmith relates a circumſtance, in which the cataſtrophe, though ſomewhat ſimilar, was yet more terrible. A Guinea Captain was, by ſtreſs of weather, driven into the harbour of Belfaſt, in Ireland, with a lading of very ſickly ſlaves, who, in the manner abovementioned, took every opportunity to throw themſelves overboard, when brought upon deck, as is uſual, for the benefit of the freſh air. The Captain perceiving among others, a woman ſlave attempting to drown herſelf, pitched upon her as a proper example to the reſt. As he ſuppoſed that they did not know the terrors attending death, he ordered the woman to be tied with a rope under the arm-pits, and ſo let her down into the water. When the poor creature was thus plunged in, and about halfway down, ſhe was heard to give a terrible ſhriek, which at firſt was aſcribed to her fears of drowning; but ſoon after the water appearing red all around her, ſhe was drawn up, and it was found that a ſhark, which had followed the ſhip, had bitten her off from the middle.

The *blue ſhark.* One of this ſpecies was caught in 1779 on the coaſt of Devonſhire; the ſkin of which was ſtuffed, and depoſited in the Britiſh Muſeum.

Dr. Watſon, F. R. S. gives the following deſcription of it, the body is of a fine blue colour, dark on the back, lighter on the ſides; the fins and tail of a dirty blue; the belly, and all the under part of the fiſh white. No orifices are to be ſeen behind the eyes, as is uſual with fiſh of this genus. Two white membranes, one to each eye, perform the office of eye-lids. When the head was placed downwards, a pretty large white pouch came out of its mouth. Ælian ſuppoſes this to ſerve as an aſylum to the young brood in time of danger. We mention this opinion, as corroborated by the judgment of Mr. Pennant, who gives credit to the ſtory, and thinks that this fiſh, like the opoſſum, may have a place fitted by nature for the reception of her young. Much reſpect is due to Mr. Pennant's opinion: the fact had been denied by ſome writers; but nothing, ſurely, is ſo contemptible as that affectation of wiſdom which ſome diſplay by univerſal incredulity.

The fiſh alluded to meaſured ſix feet eight inches, was a female, and weighed fifty-five pounds.

The *balance-fiſh* is chiefly characterized by the formation of its head, ſpreading on each ſide into the ſhape of a balance: or, as ſome have compared it, not improperly, to the head of a mallet, or hammer, except that it is depreſſed; at the ends or faces of which the eyes are ſituated.

They inhabit the Mediterranean, and are ſaid to grow to a very great ſize, indeed, little inferior to the whale: when young the colour is uniformly yellow; the adults have the upper part black, the lower white.

The *ſaw fiſh* has its noſe lengthened into a long flat griſtly body, armed on each ſide, with from twenty-four to twenty-ſeven ſlender teeth; the lips are covered with rough hard tubercles inſtead of teeth; an aperture behind each eye for the diſcharge of water; two dorſal fins; a narrow ſlip cut half way down the inner ſide of the ventral fins; the end of the tail obliquely truncated; and the fiſh is about twenty feet in length.

It inhabits all ſeas from Greenland to thoſe of the Braſils; it is alſo found in thoſe of Africa, and of the Eaſt-Indies. Some writers have miſ-named this fiſh, or confounded it with the ſword-fiſh, (which ſee properly characterized under the head *xiphias*, among the ſpinous-fiſh.) Anderſon, Crantz, and other writers on the natural hiſtory of Greenland and Iceland, make it the enemy of the ſeals and whales; aſſerting that it eats only the tongue of the latter, leaving the reſt of the huge carcaſe a prey to the morſes and ſea birds.

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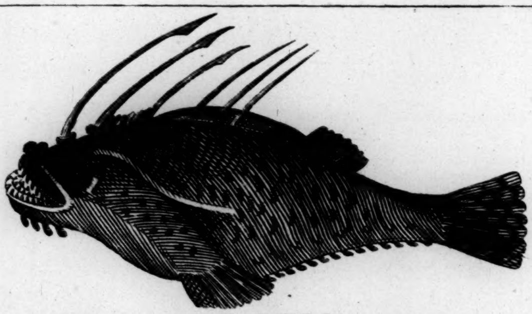
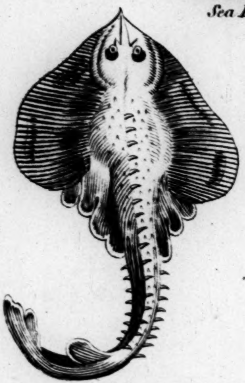
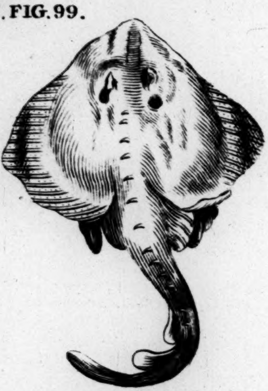


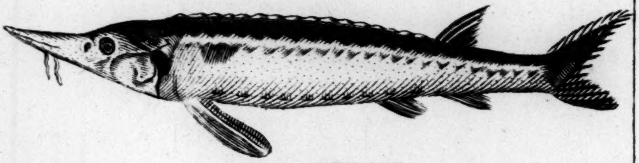
*Sea Devil*. FIG. 99.



*Ray Fish*. FIG. 97.



*Ray Fish* FIG. 98



*Sturgeon* FIG. 100.

## THE STURGEON, HUSO, &c.

THE *Sturgeon* is a well-known, large, and fine-taſted fiſh, in its general form reſembling a freſh-water pike: the delicacy and firmneſs of its fleſh is much admired, which is as white as veal, with a body as large, and a form ſcarce leſs terrible than the fiſh we have juſt deſcribed; the ſturgeon is yet ſo harmleſs, ſo incapable and unwilling to injure others, that it flies from the ſmalleſt fiſh, and generally falls a victim to its own timidity. It is one of thoſe fiſh which ſpend part of their time in rivers and part in the ſea; but it never ventures far out, uſually frequenting ſuch parts as are not far from the æſtuaries of great rivers. The moſt that we receive, and generally pickled, comes either from the Baltic rivers, or North America; though they have been accidentally caught in the Thames; the largeſt perhaps ever caught in Britain was one taken in the river Eſke, in Cumberland, which weighed four hundred and ſixty pounds. The body of this fiſh is formidable to appearance, being furniſhed with five rows of large bony protuberances, and a number of fins; the noſe is long, the mouth ſituated beneath, ſmall, and without jaw-bones, or teeth.

As the ſturgeon is by no means a voracious animal, it is never caught by a bait, in the ordinary manner of fiſhing, but always in nets, compoſed of ſmall cords, and placed acroſs the mouth of the river, but in ſuch a manner, that whether the tide ebbs or flows, the pouch of the net goes with the ſtream. Indeed, from the conformation of its mouth, it is not to be ſuppoſed that the ſturgeon would ſwallow any hook capable of holding ſo large a bulk, and ſo ſtrong a ſwimmer.

They uſually go up the rivers in the beginning of ſummer to depoſit their ſpawn, when the fiſhermen make a regular preparation for their reception; and though in the water they are very ſtrong, and much addicted to flouncing, yet when drawn up they become a lifeleſs, ſpiritleſs maſs, and are quietly dragged on ſhore.

Great numbers are taken thus during the ſummer months in the lakes, Friſchehaff, and Curiſch-hall, near Pillau, at the mouth of the Wolga, and other rivers that run into the Caſpian Sea. The adjacent ſhores are formed into diſtricts, and farmed out to companies of fiſhermen, ſome of which are rented at near three hundred a-year. They are alſo found in vaſt abundance in the American rivers, in May, June, and July; at which time they leap ſome yards out of the water, and falling on their ſides make a noiſe to be heard, in ſtill water, at ſome miles diſtance.

From its quality of floundering at the bottom of rivers, the ſturgeon has received its name, by the Germans, as JOHNSON obſerves, the word *ſtoeren* ſignifying to wallow in the mud. When opened there is ſeldom any thing found in its ſtomach but a ſlimy ſubſtance, whence it is obvious that it does not live upon any large animals. It grows to the length of eighteen feet, and to the weight of 500 pounds. In the manner of breeding, this fiſh is an exception among the cartilaginous kind; being, like the bony fiſh, oviparous, ſpawning in the water. Iſinglaſs is ſaid to be ſometimes made of the ſounds of this fiſh, but in very ſmall quantities.

The fleſh of the ſturgeon, when pickled, is very well known at all the tables in Europe; and is even more prized in England than in any of the countries where it is uſually caught. The fiſhermen have two different methods of preparing it: the one is by cutting it in long pieces length-wiſe, and having ſalted them, by hanging them up in the ſun to dry: thus prepared, the fiſh is ſold in all the countries of the Levant, and ſupplies the want of better proviſions.

The other method, which is generally practiſed in Holland, and along the ſhores of the Baltic, is to cut the ſturgeon croſs-ways, into ſhort pieces, and put it into ſmall barrels, with a pickle made of ſalt and ſaumure; and in this manner it is generally ſold in England.

There is a celebrated epicurean food prepared from the hard roe of the ſturgeon, under the appellation of *caviare*, formed into ſmall cakes. It is made by taking out of the ſpawn all the nerves or ſtrings, then waſhing it in white wine, or vinegar, and ſpreading it on a table; it is then ſalted and preſſed in a fine bag, and after which it is caſed up in a veſſel with a hole at the bottom, that all the ſuperfluous moiſture may drain off. This kind of food is in great requeſt among the Muſcovites, on account of their three lents; a pretty large quantity of this commodity is alſo conſumed in France and Italy, but ſeems to be ſinking into diſuſe at the politeſt Engliſh tables, where it was formerly in high eſteem. It is ſtill a conſiderable merchandize among the Turks, Greeks, and Venetians, The beſt kind is ſaid to be prepared from the *Belluga*, a fiſh caught in the Caſpian Sea: and a kind of caviare, or ſauſage, is made alſo from the ſpawn of ſome other fiſh, particularly a ſort of mullet caught in the Mediterranean.

There is another ſort of *ſturgeon*, diſtinguiſhed by fifteen ſcaly protuberances, a native of Ruſſia, and called *Buthenus*, in the technical language of Linnæus, but is probably the caviare ſturgeon of other writers.

The *huſo* is a fiſh very much reſembling the ſturgeon, and claſſed by Linnæus under the ſame genus, *accipencer:* it is a native of Ruſſia and the Danube; the body is naked, that is, it has no protuberances; grows frequently to twenty-four feet in length, and the ſkin is ſo tough and ſtrong, that it is employed for ropes, in carts and other wheel carriages. Its fleſh is ſoft, glutinous and flabby; but when ſalted acquires a better taſte, and turns red like ſalmon: it is caught from October to January, and weighs from ſeventy pounds to almoſt four hundred; but is chiefly taken for the purpoſe of furniſhing that uſeful commodity *iſinglaſs*, ſo famous as an aglutinant in medicine, as well as for the fining of wines; for both which uſes, it appears that this fiſh was known to the ancients.

The art of making iſinglaſs was long a ſecret in the hands of the Ruſſians; but has lately been diſcovered, and the following account of it publiſhed by Humphrey Jackſon, Eſq. in the 63d vol. of the Philoſophical Tranſactions.

"All authors, ſays he, who have hitherto delivered proceſſes for making iſinglaſs, have greatly miſtaken both its conſtituent matter and preparation.

"In my firſt attempt to diſcover the conſtituent parts and manufacture of iſinglaſs, relying too much upon the authority of ſome chemical authors, whoſe veracity I had experienced in many other inſtances, I found myſelf conſtantly diſappointed, Glue, not iſinglaſs, was the reſult of every proceſs; and although in the ſame view, a journey to Ruſſia proved fruitleſs, yet a ſteady a ſteady perſeverance in the reſearch proved not only ſucceſsful as to this object, but, in the purſuit, to diſcover a reſinous matter plentifully procurable in the Britiſh fiſheries, which has been found by ample experience to anſwer ſimilar purpoſes.

" It is now no longer a ſecret that the lakes and rivers in North America are ſtocked with immenſe quantities of fiſh, ſaid to be the ſame ſpecies with thoſe in Muſcovy, and yielding the fineſt iſinglaſs; the fiſheries whereof, under due encouragement, would doubtleſs ſupply all Europe with this valuable article.

" No artificial heat is neceſſary to the production of iſinglaſs, neither is the matter diſſolved for this purpoſe; for, as the continuity of its fibres would be deſtroyed by ſolution, the maſs would become brittle in drying, and ſnap ſhort aſunder, which is always the caſe with glue, but never with iſinglaſs.

The latter, indeed, may be reſolved into glue with boiling water; but its fibrous recompoſition would be found impracticable afterwards, and a fibrous texture is one of the moſt diſtinguiſhing characteriſtics of genuine iſinglaſs.

" The ſounds, or air bladders, of freſh water fiſh in general, are preſerved for this purpoſe, as being the moſt tranſparent, flexible, delicate ſubſtances. Theſe conſtitute the fineſt ſorts of iſinglaſs; thoſe called *book* and *ordinary ſtaple*, are made of the inteſtines, and probably of the peritanæum of the fiſh. The *belluga* yields the greateſt quantity, as being the largeſt and moſt plentiful fiſh in the Muſcovy river; but the ſounds of all freſh water fiſh yield more or leſs fine iſinglaſs, particularly the ſmaller ſorts, found in prodigious quantities in the Caſpian Sea, and ſeveral hundred miles beyond Aſtracan, in the Wolga, Yoik, Don, and even as far as Siberia, where it is called, *kle*, or *kla*, by the natives, which implies a glutinous matter; it is the baſis of the Ruſſian glue, which is preferred to all other kinds for its ſtrength.

" Iſinglaſs receives its different ſhapes in the following manner:

" The part of which it is compoſed, particularly the ſounds, are taken from the fiſh, while ſweet and freſh, ſlit open, waſhed from their ſlimy *ſordes*, diveſted of every thin membrane which envelopes the ſound, and then expoſed to ſtiffen a little in the air. In this ſtate they are formed into rolls about the thickneſs of a finger, and in length according to the intended ſize of the ſtaple: a thin membrane is generally ſelected for the centre of the roll, round which the reſt are folded alternately, and about half an inch of each extremity of the roll is turned inwards. The two dimenſions being thus obtained, the two ends of what is called *ſhort ſtaple*, are pinned together with a ſmall wooden peg: the middle of the roll is then preſſed a little downwards, which gives it the reſemblance of a heart ſhape; and thus it is laid on boards, or hung up in the air to dry. The ſounds, which compoſe the long ſtaple, are longer than the former; but the operator lengthens this ſort at pleaſure, by interfolding the ends of one or more pieces of the ſound with each other. The extremities are faſtened with a peg like the former, but the middle part of the roll is bent more conſiderably downwards; and, in order to preſerve the ſhape of the three obtuſe angles thus formed, a piece of round ſtick, about a quarter of an inch diameter, is faſtened in each angle with ſmall wooden pegs in the ſame manner as at the ends. In this ſtate it is permitted to dry long enough to retain its form, when the pegs and ſticks are taken out, and the drying completed; laſtly, the pieces of iſinglaſs are colligated in rows, by running packthread through the peg-holes for convenience of package and exportation.

"The membranes of the *book* ſort being thick and refractory, will not admit a ſimilar formation with the preceding; the pieces, therefore, after their ſides are folded inwardly, are bent in the centre, in ſuch a manner that the oppoſite ſides reſemble the cover of a book, from whence its name, a peg being run acroſs the middle, faſtens the ſides together, and thus it is dried like the former. This ſort is interleaved, and the pegs run acroſs the ends, the better to prevent its unfolding.

"That called *cake iſinglaſs*, is formed of the bits and fragments of the ſtaple ſorts, put into a flat metalline pan, with a little water, and heated juſt enough to make the parts cohere like a pancake, when it is dried; but frequently it is overheated, as ſuch pieces, as before obſerved, become uſeleſs in the buſineſs of fining. Experience has taught the conſumer to reject them.

"It has long been a prevalent opinion, that ſturgeon, on account of its cartilaginous nature, would yield great quantities of iſinglaſs; but, on examination, no part of this fiſh, except the inner coat of the ſound, promiſed the leaſt ſucceſs. This being full of *rugæ*, adheres ſo firmly to the external membrane, which is uſeleſs, that the labour of ſeparating them ſuperſedes the advantage. The inteſtines however, which in the larger fiſh extend ſeveral yards in length, being cleanſed from their mucus, and dried, were found ſurpriſingly ſtrong and elaſtic, reſembling cords made with the inteſtines of other animals, commonly called *cat-gut*, and, from ſome trials, promiſed ſuperior advantages, when applied to mechanic operations."

## OF CARTILAGINOUS FISH, *viz.* THE RAY, SCATE, THORNBACK, &c.

THE fiſh of this diviſion, or Ray fiſh, are characteriſed by ſwimming flat on the water; having their eyes and mouth placed quite under the body, with apertures for breathing either about or near them: and by having teeth, or a rough bone anſwering the ſame purpoſe. The tail differs materially from other fiſh, being narrow and ending in a bunch, or point, and thus having a great reſemblance to that of quadrupeds. Their bowels are wide towards the mouth, and gradually diminiſh towards the tail.

The eſſential diſtinction, however, is the ſpines, or prickles which they have on different parts of their body, or at the tail; and which in ſome are comparatively ſoft and feeble, in others ſtrong and piercing. Some are armed with theſe ſpines both above and below; others have them on the upper part only; ſome have their ſpines on the tail; ſome have three rows of them, and others but one. The ſmalleſt of theſe ſpines are uſually inclining towards the tail; the larger towards the head.

The whole of this tribe reſemble each other ſo much in their external form, that it is only by experience the diſtinction can be made; and that diſtinction conſiſts eſpecially in the ſituation of their ſpines.

The *thornback*, or prickly ray, has its ſpines diſpoſed in three rows upon the back; a tranſverſe cartilage in the belly; the head and body very flat and depreſſed; the figure of the body, excluſive of the tail, is nearly ſquare; the tail long and ſlender, but a little depreſſed or flatted; the belly altogether plain, but riſing a little in the middle into a convexity; the eyes ſtand on the uppermoſt part of the body, at a conſiderable diſtance from the beak, are a little protuberant, and covered with a ſimple naked ſkin; the mouth is ſituated on the under ſide of the body, and lies in a tranſverſe direction; is very large, and ſtands at the ſame diſtance from the extremity of the beak as the eyes do.

The *rough-ray* has its ſpines ſpread indiſcriminately over the whole back.

The *ſharp-noſed ray* has ten ſpines that are ſituated towards the middle of the back.

The *ſkate* has the middle of the back rough, and a ſingle row of ſpines on the tail. This is a well-known fiſh, long and flat, if not caught before his full growth, when he is from five to ſix feet in length. His ſkin is black and ſo very hard and rough, that it is often employed in poliſhing wood and ivory like the ſkin of a ſea-dog. This fiſh is extremely voracious, and armed with terrible teeth; nevertheleſs he has recourſe to ſtratagem in catching his living food, by concealing himſelf under the ſands. The French make of its aſhes an excellent ſoap for a certain cutaneous diſeaſe which is generally cured by ſulphur, and by them called *Savon d'Ange.*—Pliny attributes to the fleſh of this fiſh a ſingular virtue, when applied freſh to the necks of women,—that of preventing them from growing too large: it is certain it was very much uſed by the Romans: and Rondelet, one of the firſt naturaliſts of the ſixteenth century, aſſures us, that he tried the experiment with ſucceſs.

The *fire-flare* has but one ſpine—but it is a terrible one. It is placed on the tail, about four inches from the body, and is not leſs than five inches long; of a flinty hardneſs, the ſides thin, ſharp pointed, and cloſely and ſharply bearded the whole way.

The *torpedo* comes under the ſame genera of fiſh as the preceding, with which it certainly correſponds in form, though it poſſeſſes ſome very diſtinguiſhing peculiarities: it has no ſpines with which it can wound: but its benumbing, or torporific, quality is one of the moſt potent and extraordinary faculties in nature. Such are the moſt marked properties of this dangerous claſs; and without a knowledge of which the unlucky ſtranger might imagine he is only handling a ſkate, when he is inſtantly ſtruck numb by a torpedo; or ſuppoſe that he has he caught a thornback, until he is ſtung by the fire-flare. Thus they are as injurious to thoſe who are ignorant of their qualities, as uſeful to him who can diſtinguiſh their differences.

In their uſe indeed they differ much, but their ſimilitude as to appetite and conformation is perfect and entire. Of all the larger fiſh of the ſea, theſe are the moſt numerous, and they owe their numbers to their ſize; for except the ſhark and cachalot, there is not any fiſh that has a ſwallow capacious enough to take them in; and their ſpines would, even to the ſhark, make them a dangerous repaſt: the ſize alſo of many is ſuch, that even the ſhark himſelf would be unable to devour them. Nor do they perhaps often meet, for the ſame rapacity that impels the ſhark along the ſurface of the water, actuates the flat-fiſh at the bottom, where they creep in ſecurity, and ſeize every thing that comes in their way; neither the hardeſt ſhells, nor the ſharpeſt ſpines, giving protection to the animal that bears them; ſuch is their inſatiable hunger that they devour all; and ſuch the force of their ſtomach, that it eaſily digeſts them.

Their retreat is generally in ſuch parts of the ſea as have a black muddy bottom, where the largeſt keep at the greateſt depth, and conſequently are but ſeldom ſeen; and as they may have been growing for ages, the extent of their magnitude muſt be unknown. The Norwegian kraken, which we have already alluded to, is ſaid to be of this claſs; and though we may ſuſpend our aſſent to the opinion of its being above a mile over, yet as we know theſe fiſh to be the largeſt inhabitants of the deep, the extravagance of the good Biſhop's ſuppoſitions does not deſtroy the probability that fiſh of this tribe arrive to a moſt enormous ſize.

It is well known that the Engliſh fiſhermen have often caught ray-fiſh that have weighed above two hundred pounds: and yet that weight is trifling, compared to their enormous bulk in other parts of the world. Among many inſtances we need only adduce the account given by Labat of a prodigious ray, ſpeared by the Negroes at Guadaloupe.

"This fiſh, (ſays he) was thirteen feet eight inches broad, and above ten feet from the ſnout to the inſection of the tail, which was itſelf in proportion, being no leſs than fifteen feet long, twenty inches broad, at its inſertion, and tapering to a point. The body was two feet in depth: the ſkin as thick as leather, and marked with ſpots, which ſpots in all of this kind, are only glands that ſupply a mucus to lubricate and ſoften the ſkin. This enormous fiſh was utterly unfit to be eaten by Europeans; but the Negroes choſe out ſome of the niceſt bits, and carefully ſalted them up as a moſt favourite proviſion."

The ray-fiſh generate in May and April, and the females are prolific to an extreme degree. No leſs than three hundred eggs having been taken out of the body of a ſingle ray, covered with a tough horny ſubſtance, which they acquire in the womb, by the concretion of the fluids of that organ. When come to maturity, they are excluded, only one at a time, at intervals of three or four hours. Theſe eggs, or purſes, as the fiſhermen call them, are uſually caſt about the beginning of May, and they continue caſting moſt part of the ſummer.

During the time of their feeling the œſtrum, they are often ſeen ſwimming about the ſurface of the water, and ſeveral of the males purſuing one female; and ſo faſt do they adhere in coition, that the fiſhermen frequently draw up both together, though only one has been hooked.

When the breeding time ceaſes, which is about October, they are become very poor and thin; but they ſoon begin to recover, and gradually increaſe in goodneſs until the following May, when they have reached the higheſt ſtate of perfection.

The Dutch fiſhermen, who are indefatigable in their purſuits, begin their operations very early in the winter, in which the Engliſh ſucceed them, but ſeldom with equal ſucceſs. The method is by lines, and is certainly fatiguing and dangerous; but the value of the capture generally repays the pain. The ſkate and thornback are very marketable articles, good food, and their weight, which is from ten to two hundred pounds weight, amply repays the trouble.

The fiſhermen are however often incommoded by very troubleſome viſitors; namely by the rough ray, the fire-flare, the ſea devil, and the torpedo; to all of which they have, with good reaſon, the moſt mortal antipathy; though in ſpite of every caution, they ſometimes feel the dangerous reſentment of this vindicative tribe. Of theſe the rough-ray is certainly the leaſt pernicious; and a ſtranger would take it in his hand without any apprehenſion; though he would ſoon be convinced that there is no way of ſeizing the animal but by the little fin at the end of the tail; as there is not a ſingle part of its body that is not armed with ſpines, which inflict numberleſs wounds.

But the fire-flare is the dread of the moſt experienced and boldeſt fiſhermen. We have deſcribed its offenſive weapon, which grows from the tail, barbed, and about five inches in length; and which is not leſs an inſtrument of terror to modern, than it was to the ancient fiſhermen who have delivered many tremendous fables of its extraordinary effect.

The antient naturaliſts have not been leſs prolix on this ſubject: Pliny has ſupplied it with a venom that effects even the inanimate creation:—"trees that are ſtruck by it inſtantly loſe their verdure; and rocks themſelves are incapable of reſiſting the potent poiſon. The enchantreſs Circe armed her ſon with a ſpear headed with the ſpine of the trygon, as the moſt irreſiſtible weapon ſhe could furniſh him with: a weapon that was to be ſoon after the death of his father."

The wound that is inflicted by an animal's tail has, no doubt, ſomething terrible in the idea, and may from thence alone be ſuppoſed to be fatal; terror might add poiſon to the pain, and call up imaginary danger; hence the negroes univerſally believe that the ſting is poiſonous: yet they never die in conſequence of the wound, and the ſimplicity and ſlightneſs of the remedy ſufficiently argue the innoxiouſneſs of the wound; for by opening the fiſh, and laying it to the part injured, it effects a ſpeedy cure. Hence there is ſufficient cauſe to declare againſt its venomous qualities, notwithſtanding the aſſertions of moſt of the fiſhermen, and the opinion of ſome men of learning: the ſpine of the ray ſeems to be in fact a weapon of offence, capable of inflicting a very terrible wound, and attended with dangerous ſymptoms; but not poſſeſſed of any degree of poiſon. The ſpine has no ſheath to preſerve the ſuppoſed venom on its ſurface; nor has the animal any gland that ſeparates the noxious fluid. It is fixed to the tail as a quill is into the tail of a fowl, and is annually ſhed in the ſame manner; it may therefore be neceſſary for the creature's defence, but cannot be neceſſary for its exiſtence.

Spears and darts, ſays Mr. Pennant, might in very early times have been headed with the ſpine of the fire-flare, inſtead of iron. The

Americans head their arrows with the bones of fiſh at this day, and from their hardneſs and ſharpneſs they are no inconſiderable weapons.

## THE TORPEDO.

WE have already mentioned this creature in the diviſion of cartilaginous flat-fiſh; but its celebrity among both ancient and modern naturaliſts, is for a remarkable numbneſs with which it ſtrikes the arm of thoſe who touch it. Its external appearance agrees with that of the ray-fiſh in general, and much reſembles the thornback. It is commonly found upon the coaſts of Provence, Gaſcony, &c. in France, (as well as by our own fiſhermen) where the people eat it without danger.

The body of the torpedo is almoſt circular, and thicker than others of the ray kind; the ſkin is ſoft, ſmooth, and of a yellowiſh colour, marked as are all the kind, with large annular ſpots: the tail tapering to the point; and the weight of the fiſh from a quarter to fifteen pounds; though Rhedi mentions one which he found weighing twenty four pounds.

Upon touching the torpedo with the finger, it frequently, though not always, happens, that the perſon feels an unuſual pain and numbneſs, which ſuddenly ſeizes the arm up to the elbow, and ſometimes to the very ſhoulder, or head.

The pain is of a very particular ſpecies, and not to be deſcribed by any words; yet Lorengini, Berelli, Rhedi, and Rheaumur, who all felt it ſeverely, obſerve it to bear ſome reſemblance to that painful ſenſation felt in the arm upon ſtriking the elbow violently againſt a hard body; though Rheaumur aſſures us that this gives but a very faint idea of it.

Its chief force is at the inſtant it begins; it laſts but a few moments, and then vaniſhes entirely. If a man do not actually touch the torpedo, how near ſoever he holds his hand, he feels nothing:—if he touch it with a ſtick, he feels a faint effect:—if he touch it through the interpoſition of any pretty thin body, the numbneſs is felt very conſiderably; if the hand be preſſed very ſtrong againſt it, the numbneſs is the leſs, but ſtill ſtrong enough to oblige a man ſpeedily to let go.

Rheaumur accounts for the phenomena of the torpedo in this manner: the torpedo like other flat-fiſh, is not abſolutely flat; but its back, or rather all the upper parts of its body, a little convex: when it did not, or would not produce any numbneſs in ſuch as touched it, its back, he found, always preſerved its natural convexity; but whenever it would diſpoſe itſelf to reſent a touch, or thruſt, it gradally diminiſhed the convexity of the back parts of the body, ſometimes only rendering them flat, and ſometimes even concave.

The very next moment the numbneſs always begins to ſeize the arm; the fingers that touched were obliged to give back, and all the flat and concave part of the body was ſeen again convex; and where as it only became flat inſenſibly, it returned to its convexity ſo ſwiftly that one could not perceive any paſſage from the one to the other ſtate.

The motion of a ball out of a muſket is not perhaps much quicker than that of the fiſh reaſſuming its ſituation; at leaſt the one is not more perceivable than the other. It is from this ſudden ſtroke that the numbneſs of the arm ariſes, and accordingly the perſon, when he begins to feel it, imagines that his fingers have been violently ſtruck. "*It is the* MERE VELOCITY *of the ſtroke that produces the numbneſs.*" This aſſertion we ſhall however preſently ſhew to be ill founded. Rheaumur adds, that the ſingle ſtroke of a ſoft body could never effect this; but in the preſent caſe there is an infinity of ſtrokes given in an inſtant.

To explain the admirable mechaniſm thereof, we muſt give a view of the parts whereon it depends, which conſiſt of two very ſinglular muſcles, called by Rhedi and Lorenzini the *muſculi ſalcati*; their form is that of creſcents, and they together take up almoſt half the back of the fiſh, the one on the right ſide, and the other on the left; their origin is a little above the mouth, and they are ſeparated from each other by the bronchia, into the laſt of which they have their inſertions. What is ſingular in them is their fibres, if we may give that name to a ſort of ſmaller muſcles, as big as gooſe quills of which the two great muſcles are formed.

Theſe leſſer muſcles are hollow cylinders, their length nearly equal to the thickneſs of the fiſh, and ranged aſide of each other, all perpendicular to the upper and lower ſurſaces of the fiſh, accounting theſe ſurfaces as nearly parallel planes.

The exterior ſurface of each of theſe cylinders conſiſts of whitiſh fibres, whoſe direction is the ſame with that of the cylinder, and forming a kind of tube, the cavity of which is full of a ſoft matter, of the colour and conſiſtence of pap, divided into twenty-five, or thirty different little maſſes, by ſo many partitions parallel to the baſe of the cylinder; which partitions are formed of tranſverſe fibres; ſo that the whole cylinder is in ſome meaſure compoſed of twenty-five, or thirty cylinders placed over each other, and each full of a medullary ſubſtance.

We need only now remember, that when the torpedo is ready to ſtrike its numbneſs, it ſlowly flattens the outer ſurface of its upper part, and the whole mechaniſm, continues Rheaumur, on which its force depends, will be apparent. By that gradual contraction it bends, as it were, all its ſprings, renders all its cylinders ſhorter, and at the ſame time augments their baſis. But the contraction being made to a certain degree, the ſprings again unbend; and if a finger then touch the torpedo, it inſtantly receives a ſtroke which ſhakes the nerves, ſuſpends, or changes the courſe of the animal ſpirit:—or, if the idea be more diſtinct, theſe ſtrokes produce an undulatory motion in the fibres of the nerves, which claſhes, or diſagrees, with what they ſhould have in order to move the arm; and hence the inability we are under of uſing the ſame, and the painful ſenſation which accompanies it. Hence it is, alſo, that the torpedo does not convey its numbneſs to any degree except when touched on theſe great muſcles; ſo that the fiſh is very ſafely taken by the tail, which is the part by which the fiſhermen catch it.

Lorenzini and others, have endeavoured to account for the effect of the torpedo from toporific effluvia; this Rheaumur objects to with a variety of ingenious arguments; and eſpecially obſerves, that the torpedo conveys its numbneſs to the hand through a hard ſolid body, but does not do it through the air.

Such is the ingenious hypotheſes of Rheaumur, from whoſe experiments, however it is pretty evident, that it is *not neceſſary*, but *by an effort*, that the torpedo numbs the hand of him that touches it; but his inference cannot ſo well be admitted, that the whole of this animal's exertions ariſe from the greatneſs of the blow which the fingers receive at the time they are ſtruck. The ſtroke is no doubt powerful; but it is well known that a blow though never ſo violent on the points of the fingers, diffuſes no numbneſs over the whole body ; nor, indeed, however painful, will it reach beyond the fingers themſelves. Blows, to cauſe numbneſs muſt be applied to ſome great leading nerve, or to a large ſurface of the body.

The moſt probable ſolution that has been attempted for this extraordinary phenomenon, is the ſuppoſition that the ſhock proceeds from an animal electricity with which this fiſh abounds, or which it has ſome hidden power of ſtoring up, and producing on its moſt urgent occaſions. From what Kempfer relates, as well as by all other accounts, the ſhock received moſt reſembles the ſtroke of an electrical machine ; ſudden, tinkling and painful : the ſhocks are entirely ſimilar, the duration of the pain is the ſame :— yet ſtill it exceeds all human knowledge how the electric matter is originally procured, how the animal contrives to renew the charge, or how it is prevented from evaporating it on contiguous ſubjects.

" The inſtant, ſays Kempfer, I touched it " with my hand, I felt a terrible numbneſs in " my arm, and as far up as my ſhoulder. Even " if one treads upon it with the ſhoe on, it af- " fects not only the leg, but the whole thigh " upwards. Thoſe who touch it with their foot

" are ſeized with a ſtronger palpitation than " even thoſe who touch it with the hand. This " numbneſs bears no reſemblance to that which " we feel when a nerve is a long time preſſed, " and the foot is ſaid to be aſleep; it rather " appears like a ſudden vapour, which, paſſing " through the pores in an inſtant, penetrates " to the very ſprings of life, from whence it " diffuſes itſelf over the whole body, and gives " real pain. The nerves are ſo affected, that " the perſon ſtruck imagines all the bones of " his body, and particularly thoſe of the limb " that received the blow, are driven out of " joint. All this is accompanied with an uni" verſal tremor, a ſickneſs of the ſtomach, a " general convulſion, and a total ſuſpenſion of " the faculties of the mind.

" In ſhort, continues Kempfer, ſuch is the " pain, that all the force of our promiſes and " authority could not prevail upon a ſeaman to " undergo the force of a ſhock a ſecond time. " A negro, indeed, that was ſtanding by, rea" dily undertook to touch the torpedo, and " was ſeen to handle it without feeling any of " its effects. He informed us, that his whole " ſecret conſiſted in keeping in his breath: and " we found, upon trial, that this method

" anſwered with ourſelves."—In this matter, however, Kempfer was miſtaken; for ſucceeding experience has abundantly convinced the world, that holding in the breath no way guards againſt the violence of the ſhock; and thoſe who may depend on ſuch an antidote may be very painfully undeceived.

The baneful powers of this fiſh are known to decline with its vigour; as its ſtrength ceaſes, the force of the ſhock ſeems to diminiſh, till at laſt, when the fiſh is dead, the whole power is deſtroyed, and it may be handled or eaten with perfect ſecurity. Though when firſt taken out of the ſea, its force is very great, and not only affects the hand, but even if touched with a ſtick, the perſon ſometimes feels himſelf affected. This latent power is ſaid to be more extenſive in the female than the male.

But as every phenomenon, not readily accounted for, is generally ſwelled into the *marvellous*, ſo we muſt not believe the torporific influence to be extended to the degree that ſome would have us believe; as reaching the fiſhermen at the end of the line, or numbing the fiſh in the ſame pond.—Gedignus, in his Hiſtory of Abyſſinia, carries this quality to a moſt ridiculous exceſs; for he tells us of one of theſe that was put into a baſket with ſome *dead* fiſh, and that the next morning the people to their utter aſtoniſhment, perceived that the torpedo had actually *numbed* the *dead fiſh into life again.*

Were the only uſe the torpedo makes of its faculty the ſaving itſelf from the fiſhermen, as ſome have ſuppoſed, it would ſignify but little, for it is very rare that it eſcapes their hands. Moſt naturaliſts therefore agree, that it likewiſe ſerves it for the purpoſe of catching other fiſh; and that it is generally found on banks of ſand, &c. probably to ſerve it as a foundation or ſupport for the exerting its faculty.

M. Rheaumur had no fiſh alive to ſee what the torpedo would do to them; but an animal next akin to a fiſh, he tried it on, viz. a drake; which being ſhut up a-while in water with the fiſh, was taken out dead; doubtleſs from its too frequent contacts on the torpedo.

Time and obſervation have diſcovered that more fiſh than this of the ray kind poſſeſs this numbing or torporific quality. They are ſaid to be ſhaped like a mackerel, except that the head is much larger; and, according to Atkins and Moore are found in great abundance along the coaſt of Africa: but their powers ſeem to differ in ſome reſpects. Moore obſerves, " that " there was no man in the company that could " bear to keep his hand upon this animal the " twentieth part of a minute, it gave him ſo " great pain; but upon taking the hand away, " the numbneſs went off, and all was well " again. This numbning quality continued " in the torpedo even after it was dead; and " its very ſkin was poſſeſſed of this extraordi" nary power till it became dry." This circumſtance ſufficiently proves that the fiſh he ſpeaks of, muſt be ſome other, as it could not poſſibly take place with the ray torpedo.

Condamine (ſays Dr. Goldſmith) informs us of a fiſh poſſeſſed of the powers of the torpedo, and of a ſhape reſembling the lamprey in every reſpect. This animal, if touched by the hand, or even with a ſtick, inſtantly benumbs the hand and arm to the very ſhoulder, and ſometimes the man falls down under the blow. Theſe animals therefore muſt effect the nervous ſyſtem in a different manner from the others, both in regard to manner and intention; but how this effect is wrought, is an operation that at preſent remains in obſcurity.

M. du Hamel, in his Hiſtory of the Academy of Sciences, mentions a kind of torpedo, or torporific animal, which he compares to congor eels. M. Richer, who furniſhed Du Hamel with the account, affirms, on his own knowledge, that they numb the arm ſtrongly, when touched with a ſtaff, and that their effects even produce vertigos.

This torporific eel has been recently mentioned by Dr. Bancroft, in his Natural Hiſtory of Guiana, in South America, who ſtates the following circumſtances relating to it.

" If the torporific eel is caught with a hook
" and line, the perſon that holds the line feels
" a ſhock like that of electricity.

" If a perſon who touches it with a rod holds
" the hand of another perſon—that perſon of
" a third—and ſo on to a dozen, a violent
" ſhock will be felt by all at the ſame inſtant.

" If a perſon holds his finger in the water
" at the diſtance of ten feet from the fiſh, he
" will receive a violent ſhock at the moment
" when the fiſh is touched by another perſon.

" If the fiſh is enraged, and puts his head
" above water, and the hand of a perſon comes
" within five or ſix inches of it, he will feel a
" ſhock, nearly the ſame as if at another time
" he had touched it."

## THE LAMPREY.

THIS fiſh is of a lighter colour and clumſier make than the eel, which, however, it much reſembles in its general appearance: but its mouth has a greater likeneſs to that of a leech than an eel, it being round, and placed rather obliquely below the end of the noſe. The animal has alſo a hole on the top of the head, through which it ſpouts water like the cetaceous tribe. On each ſide are ſeven holes for reſpiration; and the fins are formed rather by a lengthening out of the ſkin, than any ſet of bones or ſpines for that purpoſe.

Naturaliſts diſtinguiſh between the *lampein* and the *lamprey*, the former is ſaid to have a ſingle row of little teeth in the verge of its mouth, beſides the lower large ones. It grows to about a foot and a half, though moſt of thoſe uſually caught are under that ſtandard.—The latter has about twenty rows of teeth, and grows to two feet and a half, or more in length.

Muralto, in his very minute deſcription of this animal, makes not any mention of lungs;—yet from ſome peculiarity in its formation, the lamprey generally ſwims as near as poſſible to the ſurface; and it might be eaſily drowned by being forcibly kept under water for a conſiderable time. The abſolute neceſſity it is under of breathing in the air, muſt convince the attentive obſerver that it really has lungs; and it is very probable that two red glands tiſſued with nerves, (deſcribed by Muralto as lying towards the back of the head) are no other than the lungs of the animal.

The lamprey uſually leaves the ſea the beginning of ſpring, in order to ſpawn, and after a ſtay of a few months, it returns again to the ſea. The ſpecies known among us is differently eſtimated according to the ſeaſon in which it is caught, or the place where it has been fed. The beſt ſeaſon for them is the months of March, April and May; and they are uſually taken in nets with ſalmon, and ſometimes in baſkets at the bottom of the river.

Thoſe that leave the ſea to depoſit their ſpawn in freſh waters, are the beſt; thoſe that are entirely bred in our rivers, and that have never been to ſea, are conſidered as much inferior to the former. Such as are caught after they have caſt their ſpawn, are found to be flabby, and of little value, and particularly ſo at the approach of hot weather. In many parts of Ireland the people will not venture to touch them. Thoſe caught in the Engliſh Severn are conſidered as the moſt delicate of all other fiſh whatever: and it has been an old cuſtom for the city of Glouceſter to preſent the King annually with a lamprey-pie; and as the gift is made at Chriſtmas, the difficulty of procuring a ſufficient quantity is ſo very great, that the corporation have ſometimes been obliged to purchaſe them at a guinea a piece.

The Lamprey was in high demand among our forefathers: So late as the reign of Henry V. we find that a ſpecific power was granted to two perſons to buy, take, and provide all the live lampreys they could, in or out of the Seine, between Rouen and Harfleur; and to two others the like power between Liſlebon and Harfleur; ſo that it ſhould ſeem Henry V. was not afraid of the ill effects of eating this fiſh which coſt Henry I. his life.

One quality with which this fiſh is endued deſerves notice, namely, its peculiar adheſiveneſs;

neſs; for as its mouth is formed very much reſembling that of the leech, ſo the lamprey, like that creature, has the property of ſticking cloſe to, and ſucking any body it is applied to. Such is their extraordinary power in adhering to ſtones, that we are told of one which weighed but three pounds, and yet it ſtuck ſo firmly to a ſtone of twelve pounds, that it remained ſuſpended at its mouth, from which it was ſeparated with difficulty.

Naturaliſts aſcribe this wonderful power of ſuction in the animal, to its exhauſting the air within its body by the hole over the noſe, while the mouth is cloſely fixed to the object, and permitting no air to enter. If this be really the cauſe, the weight which the fiſh will be able to ſuſtain may pretty accurately be determined; for it will be equal to the weight of a column of air of the ſame diameter as the mouth of the fiſh.

The power of adheſion in the lamprey may probably be ſomewhat increaſed by that ſlimy ſubſtance with which its body is all over ſmeared; a ſubſtance that ſerves equally to preſerve its ſkin ſoft and pliant, as to keep it in a proper degree of warmth in the watery element.

ment. Two lymphatic glands, extending on each ſide from the head to the tail, ſerve to ſeparate this mucus, and furniſh it in great abundance.

The lamprey has no other inteſtines than one great bowel, running from the mouth to the vent, wide in the middle, but narrow at both ends.

The ſimplicity of the lamprey's appetite perfectly correſponds with the ſimplicity of its conformation; for its food ſeems to be either ſlime and water, or ſuch ſmall water inſects as are ſcarce perceivable. When it comes into our rivers, it is hardly perceived to eat any thing; though in its native element, the ſea, perhaps its appetite may be more active.

The preparation made by the lampreys for ſpawning is a noticeable circumſtance in their natural hiſtory. Previous to their depoſiting their ſpawn, they make holes in the gravelly bottom of rivers; and if they meet with a ſtone of conſiderable magnitude, their power of ſuction is particularly ſerviceable, and ſucceſsfully exerted in removing and throwing it out. Like other flat fiſh, the lampreys are produced from eggs, but are not, like moſt others, left to chance for their maturation; for the female remains

mains near the place where they are excluded, and continues with them until they come forth. One ſingle brood is the extent of the female's fertility; and ſhe, according to Rondoletius, may be frequently ſeen playing about them; and after ſome time ſhe conducts them in triumph back to the ocean, at leaſt ſuch as have ſufficient ſtrength for that purpoſe; the remainder continue in the freſh water until they die, or are caught; but their flavour never equals that of ſuch of them as have undergone a ſea-voyage.

The exiſtence of the lamprey is of very ſhort duration:—after caſting her eggs, ſhe becomes flabby and exhauſted, appears prematurely old, and two years generally puts a termination to her natural life.

That the lamprey was the name of a fiſh in high eſteem among the ancients, is a circumſtance pretty generally known; as well as that there is a ſpecies of the lamprey ſerved up as one of the greateſt dainties among the modern Romans: Whether theirs be the murena of the ancients, is not eaſily to be aſcertained; but that our lamprey is not, needs no argument to prove. The lamprey of the Italians agrees with the ancient fiſh, in being kept in ponds, and conſidered by the luxurious as a very great delicacy.

An anecdote recorded by the Roman writers, as it relates to the fiſh whoſe hiſtory we have juſt given, may be not improperly repeated in this place:—A ſenator of rank had attained to very great celebrity for his taſte in good eating, and the luxury of his table: his fiſh in particular were diſtinguiſhed for flavour and feeding: Auguſtus became his gueſt, and found that fame had done juſtice to his merits—his lampreys were indeed of excellent taſte. The Emperor was deſirous to know by what means he gave them ſo fine a reliſh: the epicure was happy to inſtruct the Emperor, and told him, "that it was his cuſtom to throw into his pond ſuch of his ſlaves as had at any time diſpleaſed him." Auguſtus did not admire the receipt—for he inſtantly ordered all the man's ponds to be filled up; and perhaps many of our readers would not be ſorry could we have informed them that the owner had been thrown in with the reſt of the rubbiſh.

## ANAMALOUS CARTILAGINOUS FISH.

### THE SEA ORB.

OF this unſhapely and extraordinary creature, there are ſeveral varieties: ſome threaten only with their ſpine; others are defended with a bony helmet that covers the head; ſome with a coat of mail from the head to the other extremity; and others again armed offenſively and defenſively with bones and ſpines. Their armour is in all caſes formidable, and the greater number of them venomous in their nature, as fatal experience has proved. In general we know ſo little of them beſides their figure, that naturaliſts are not agreed what ſtation they ought to hold in the ſcale of fiſh:—their deformity, however, is obvious; and the diſtance at which they are placed from us, being chiefly found in the Oriental or American ſeas, may have prevented a more critical enquiry.

The general marks of this creature are, that its figure is almoſt round; that it has a mouth like a frog, and is from ſeven inches to two feet long. It is covered with long thorns, which point on every ſide; and when the animal is enraged, it can blow up its body as round as a bladder.

The *Centriſcus* includes two ſpecies; one having its back covered with a ſmooth bony ſhell, which ends in a ſharp ſpine, under which is the tail. It is a native of the Eaſt-Indies. The other, which is found in the Mediterranean, has a rough ſcabrous body, and a ſtraight extended tail. In both, the head gradually ends in a narrow ſnout, the aperture is broad and flat; the belly keel-formed, and the belly-fins united. It wounds with its fins.

The *Oſtracion Cornutus* is found in the Indian Ocean; it has a long ſpine in front of each eye, and one on each ſide the vent, pointing to the tail; the body quadrangular, reticulated with a raiſed line; the tail very long.

The *Five-ſpined Coney Fiſh* is alſo ſuppoſed to be an inhabitant of the Indian Ocean The body is triangular, and retriculated by ſunk lines into hexangular and heptangular meſhes, each bound a little within the line by a black ſtripe; before each eye a ſhort ſtrong ſpine; a third on the middle of the back, and one on each ſide the belly near the vent; the body from the vent to the tail covered with a ſoft ſmooth ſkin; the tail round at the end.

It is probable that this genus has the power of drawing the defenceleſs parts under the bony coat of the body at the approach of danger. It ſeems neceſſary that the parts of the body to which the fins are attached, ſhould be covered with a pliable ſkin, eſpecially that part of the body near the tail; as fiſh move forward leſs with the aſſiſtance of their fins, than by the motion of their body ſideways; which is exemplified in the common method of impelling a cock-boat, by moving ſideways an oar at the helm.

The *Old Wife*, *Oſtracion bicaudalis*, a native of the above ſea, is of a triangular body, the back ſharp; the bony coat on the head and body divided by ſtriæ into many hexangular meſhes: the areas rough with numerous granule, ranged in concentric lines; the ſkinny cover of the body near the tail, and tail fin, marked with largiſh ſpots; a ſtrong ſpine on each ſide the belly, pointing towards the tail.

A fiſh, apparently the ſame as above, except that it has an oval cruſt upon its tail, is mentioned among the rarities preſerved in Greſham College.

Variety prevails equally in the ſize as in the figure of theſe animals; ſome are not bigger than a foot-ball, and others as large as a buſhel; and when enraged can inflate to a conſiderable degree, and become as round as a globe. They can flatten and erect their ſpines at pleaſure, and encreaſe the terrors of their appearance in proportion to the approach of danger:—for on being provoked, or alarmed, the body that before ſeemed ſmall, ſwells to the view, the animal viſibly increaſes in ſize, its prickles ſtand erect, and threaten the invader on every ſide.

Theſe animals are often caught by the Americans, merely for the barren pleaſure of deſtroying them. They bait a line and hook with a piece of ſea crab, which the oſtracion approaches with flattened ſpines; but on feeling its miſtake, rage takes poſſeſſion of the creature, the ſpines become erect, and it is effectually armed at all points, that no one dare venture to lay hold of it, but they drag it to ſome diſtance from the water, where it ſoon expires.

There is a kind of bag or bladder filled with air, found in the belly of moſt of theſe animals, by the inflation of which the animal ſwells itſelf in the manner above-mentioned.

The figure of the Sea Orb, and all its ſpecies is ſo very abhorrent, that ſcarce any one would wiſh to experience them as food, in which caſe, however, they are abſolutely poiſonous. The natives of theſe countries where they are found humanely and carefully inform ſtrangers of their danger:—yet the admonition was loſt upon a certain ſailor at the Cape of Good Hope, who not relying on what the Dutch had told him, concerning the venomous quality of the fiſh, was reſolved to make the experiment, and break through a prejudice which he ſuppoſed was founded on the animal's deformity. He tried and eat one, but his raſhneſs coſt him his life; he inſtantly fell ſick, and died a few days after.

## THE BALISTES.

THIS name is given as a general one to ſeveral fiſh that differ much in their characteriſtics; and the moſt noticeable of which we ſhall enumerate. The general characters are, that the head is flat, there are eight teeth on each ſide, and the two anterior ones are longeſt: in place of gills, the baliſtes has an aperture immediately above the pectoral fins; the body is flat, the ſcales are joined together by the ſkin, and the belly is keeled.

The *Unicorn Fiſh (Monoceros)* whoſe head conſiſts but of one ray; Cateſby informs us that the guts of this fiſh are full of ſmall ſhells, and coraline ſubſtances, which, by the ſtrength and hardneſs of its jaws, it is enabled to grind very ſmall. They moſtly frequent thoſe ſeas among the Bahama Iſlands, where the corals are in greateſt plenty. Theſe fiſh are not eat, being accounted poiſonous.

The *Long File Fiſh*, deſcribed by Walcot. The body not very deep; the ſkin divided by ſmooth furrows with ſmall rough ſcale-like ſpaces:—each of theſe on the ſides have a ſmall ſpine pointing towards the tail; the firſt dorſal fin has three ſpines, the firſt of which is very large and rough in front, like a file, and hence the Engliſh name; the third very ſhort, and ſituated at a conſiderable diſtance from the other two; the ſkin of the back and belly at the baſe of the dorſal and anal fins drawn out and compreſſed; pectoral fins ſmall; dorſal and anal fins triangular, and ſituate nearly oppoſite each other; the tail even at the end.

The firſt dorſal fin of this fiſh is poſſeſſed of a ſingular property;—namely, that no force can depreſs the firſt ſpine, but if the laſt be depreſſed in ever ſo gentle a manner, the other two immediately fall down with it; and as inſtantaneouſly as when a croſs-bow is let off by pulling the trigger. One ſort, found in the Mediterranean, near Rome, is on that account called *Peſce Baleſtra*, *i. e.* the Croſs Bow Fiſh.

Walcott alſo mentions another ſpecies, the body of which is much compreſſed and deep; the rays of the firſt dorſal fin ſpiny; the firſt ray very long and rough; firſt dorſal fin and the back from its baſe black; reſt of the body and the head a golden yellow; ſkin rough; tail rough; and in the place of each ventral fin a long rough ſpine.

A ſpecies, named *Hiſpidus* by naturaliſts, is found in Carolina; the head fin is not radiated, and there is a round black ſpot in the tail fin. The body is rough, and briſtly towards the tail. The ſpine or horn is ſituated between the eyes; and inſtead of a belly fin it has a jagged ſharp ſpine.

Several more ſpecies, or varieties, are found in the Indian Ocean, and at Aſcenſion Iſland.

## SEA-HORSE:—HIPPOCAMPUS.

This creature, upon the whole, more reſembles a great caterpillar than a fiſh: the head bends down towards its belly, and from its form gives name to the animal, which never exceeds nine inches in length, and is about as thick as a man's thumb.

The whole body ſeems to be compoſed of cartilaginous rings, on the intermediate membranes of which ſeveral prickles are placed.—The ſnout is a kind of tube, with a hole at the bottom, to which there is a cover that the animal can open and ſhut at pleaſure. Behind the eyes are two fins that look like ears; and above them are two holes that ſerve for reſpiration. The tail generally curls downward, along the ridges are a row of tubercles; the whole animal is ſpeckled; and while alive it is ſaid to have hair on the fore part of its body, which falls off when it is dead.

One ſpecies of theſe fiſh is common in the Mediterranean and Weſtern Ocean; but in place of tubercles has ſhort ſpines.

Another ſpecies is ſmooth, without ſpots, and is found in the Straits of Sunda, in the Eaſt Indies.

The ancients conſidered this creature as extremely venomous:—an opinion to which they were probably induced by the ſingularity of its figure.—" On the ſea coaſt near Pozzuoli, " in Italy, ſays a modern traveller, are found " certain little dried animals, called *Cavalli Marini*,

" *rini*, about the length of one's thumb; its " head reſembles a horſe's, and its body terminates in a tail like that of a ſhrimp. The " ladies make uſe of them to increaſe their " milk."

## THE PIPE-FISH.

THE thickeſt part of this animal's body is not thicker than a ſwan-quill, while it is above ſixteen inches long. The body is angular, but the angles being not very ſharp, are not diſcernible until the fiſh is dried.

It is viviparous; for on cruſhing one that was juſt taken, hundreds of very minute young ones were obſerved to crawl about. The general colour of the creature is an olive brown, marked with numbers of bluiſh lines, pointing from the back to the belly.

## THE SUCKER.

THIS genus, according to Linnæus, includes three ſpecies:—The head is obtuſe, and furniſhed with ſaw-teeth; there are four rays in the gills; and the belly fins are connected together in an orbicular lump.

The *Lumpus*, or *Lump-fiſh*, grows to the length of nineteen inches, and weighs ſeven pounds. The ſhape of the body is like that of the bream, deep and very thick, and it ſwims edgeways. The back is ſharp and elevated; the belly flat, of a bright crimſon colour. Along the body there runs ſeveral rows of ſharp bony tubercles, and the whole ſkin is covered with ſmall ones. The pectoral fins are large and broad, almoſt uniting at their baſe.

Beneath theſe is the part by which it adheres to rocks, &c. It conſiſts of an oval aperture ſurrounded with a fleſhy, muſcular, and obtuſe ſoft ſubſtance, edged with many ſmall threaded appendages, which concur as ſo many claſpers. The tail and vent-fins are purple. By means of this part it adheres with vaſt force to any thing it pleaſes.

As a proof of its tenacity it has been known, that in flinging a fiſh of this ſpecies juſt caught, into a pail of water, it fixed itſelf ſo firmly to the bottom, that on taking the fiſh by the tail, the whole pail by that means was lifted, though it held ſome gallons, without once making the fiſh quit its hold.

Theſe fiſh reſort in multitudes during ſpring to the coaſt of Sutherland, near the Ord of Caithneſs, in Scotland. The ſeals which ſwarm beneath, prey greatly upon them, leaving the ſkins; numbers of which thus emptied, float aſhore at that ſeaſon.

It is eaſy to diſtinguiſh the place where the ſeals are devouring this, or any other unctuous fiſh, by a ſmoothneſs of the water immediately above the ſpot. This fact is now eſtabliſhed; it being a tried property of oil to ſtill the agitation of the waves, and render them ſmooth.

Great numbers of lump fiſh are found in the Greenland ſeas, during the months of April and May, when they reſort to ſpawn. Their roe is remarkable large, which the Greenlanders boil to a pulp, and eat. They are extremely fat, which recommends them the more to the natives, who admire all oily food, They call them *nipiſets*, or *cat-fiſh*, and take quantities of them during the ſeaſon.

The lump-fiſh is ſometimes eaten in England, being ſtewed like the carp.

The *leſſer Sucking-fiſh* is found in different parts of the Britiſh ſeas. It is about four inches in length; the ſkin without ſcales, ſlippery, and of a duſky colour. It has alſo an apparatus for adhering to ſtones and rocks like the former.

The *Liparis* takes the name of ſea-ſnail from the ſoft and unctuous texture of its body, reſembling that of the land ſnail. It is almoſt tranſparent, and ſoon diſſolves and melts away. It is found in the ſea near the mouths of great rivers, and hath been ſeen full of ſpawn in January. The length is five inches; the colour a pale brown, ſometimes finely ſtreaked with a darker.

Beneath the throat is a round depreſſion of a whitiſh colour, like the impreſſion of a ſeal, ſurrounded by twelve ſmall pale yellow tubera, by which probably it adheres to the ſtones like the foregoing ſpecies.

## THE SUN FISH

RESEMBLES the bream kind, or ſome deep fiſh cut off in the middle. The mouth is very ſmall, and contains in each jaw two broad teeth, with ſharp edges. The colour of the back is duſky and dappled, and the belly is of a ſilvery white. It grows to a very large ſize; and has been taken of the weight of four hundred pounds.

When this fiſh is boiled, it has been obſerved to turn to a glutinous jelly; and would probably ſerve for all the purpoſes of iſinglaſs, were it found in ſufficient plenty.

## THE FISHING FROG.

NOTHING, perhaps, can exceed the deformity of this animal, the head of which is bigger than the whole body. It very much reſembles a tadpole, or young frog, but of an enormous ſize, for it grows above five feet long, and its mouth is ſometimes a yard wide. The under jaw projects beyond the upper, and both are armed with rows of ſlender, ſharp teeth; the palate and the tongue are furniſhed with teeth in like manner; the eyes are placed on the top of the head, and are emcompaſſed with prickles. Two long beards or filaments are placed immediately above the noſe; ſmall in the beginning, but thicker at the end, and ſaid to anſwer the very ſingular purpoſe of a fiſhing-line, to which uſe the animal converts them.

Pliny, as well as many of our beſt modern naturaliſts, agree in the above uſe of thoſe filaments:—"With theſe extended," ſay they, "the fiſhing-frog hides in muddy waters, and "leaves nothing but the beards to be ſeen:— "the curioſity of the ſmaller fiſh brings them "to view theſe filaments, and their hunger induces them to ſeize the bait; upon which the "animal in ambuſh inſtantly draws in its filaments with the little fiſh that had taken the "bait, and devours them without mercy." The truth of this has been doubted by other writers, upon the foundation of another ſpecies of the fiſhing-frog being found without beards, which would not be wanting, were they neceſſary to the exiſtence of the genus.

Rondoletius tells us, "that if we take out the bowels of the fiſhing frog, the body will appear tranſparent; and if a lighted candle be placed within the body, as in a lanthorn, the whole has a very formidable appearance."

But as the fiſhing-frog is an enemy to the dog-fiſh, (a ſpecies of the ſhark) the bodies of theſe fierce and voracious animals being often found in its ſtomach, the fiſhermen generally, therefore, have a regard for it, and whenever they take it, ſet it at liberty.

## THE ARMOUR FISH.

THE Armour Fiſh (*Cataphractus Americanus*) is about one foot in length, and four inches broad; a ſmall part of the belly is cartilaginous, except which, the fiſh is covered with hard thick bone, but in a different manner, viz. the head and forepart are covered with plates of bone, extending from the back to the

the belly, and lapping over one another. It is armed with three ſtrong pointed bones, thick ſet, or rather ſeparated with teeth, one placed near the back, and one near each gill. Theſe bones are three inches long, and ſo fixed in ſockets, that the fiſh can point them in any direction in defence of himſelf. The creature having no teeth for defence, Nature ſeems to have compenſated that deficiency, by beſtowing on him weapons and armour in an extraordinary manner.

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## THE VIPER-MOUTH.

THE Viper-mouth (or *Vipera Marina* of Cateſby) is about eighteen inches long; but as fiſh are not, like quadrupeds, of a determinate ſize, ſo this ſpecies is ſaid to grow to a vaſt bigneſs. The mouth is exceſſive wide; both jaws are armed with ſharp deſtructive teeth, particularly two in each jaw, much longer than the reſt, ſo as not to be admitted within the mouth: moſt of theſe long teeth have an angular bending towards their ends, in a very ſingular manner; it is without ſcales, marked all over with hexagonal diviſions. This fiſh is remarked by Cateſby to be of the oddeſt ſtructure, and moſt formidable appearance of any he ever ſaw. One of them was taken in the harbour of Gibraltar, and we believe is preſerved in the Britiſh Muſeum.

The *Ribband Fiſh* is found in the Caribbee Iſlands, and is about ſix inches in length. It is brown on the back, whitiſh on the belly; the fins and tail are of a duſky colour; it has a circle round the eye, and a black ſpot between the noſtrils; it has alſo a broad black liſt running round the head, and paſſing through the eyes; it has two other black or duſky liſts bordered with white; the firſt paſſing a little obliquely below the head, the other from the long fin on the back quite through the tail, which makes the fiſh appear as if it were bound with ribbands. The belly is the broadeſt part, and the back grows gradually thinner towards the neck, which terminates in a ridge.

## THE GALLEY FISH.

UPON the authority of Labat, this animal is claſſed among the cartilaginous fiſh, to which its habits indeed are ſomewhat ſimilar. It is ſuppoſed by Linnæus to be in part the food of the whale.

By Labat, and by Goldſmith after him, it is deſcribed as having eight broad feet, with which it ſwims, or which it expands to catch the air as with a ſail. It is very common in America, and grows to the ſize of a gooſe egg, or ſomewhat more. It is perpetually ſeen floating, and no efforts that have been tried can ſink it to the bottom. All that appears above water is a bladder, clear and tranſparent as glaſs, and ſhining with the moſt beautiful colours of the rainbow. Perſons who happen to be walking along the ſea-ſhore frequently tread upon theſe animals, and the burſting of their bodies yields a report like that when one treads upon the ſwim of a fiſh.

Indeed to the eye of an unmindful ſpectator, this animal ſeems moſt like a tranſparent bubble ſwimming on the ſurface of the ſea, or like a bladder variouſly and beautifully painted with vivid colours, where red and violet predominate, as variouſly oppoſed to the beams of the ſun. It is, however, an actual fiſh, the body of which is compoſed of cartilages, and a very thin ſkin, filled with air, which thus keeps the animal floating on the ſurface, as the waves and the winds happen to drive. Sometimes it is ſeen thrown on the ſhore by one wave, and again waſhed back into the ſea by another.

Four of its feet already mentioned, keep in the water, and ſerve as oars; while the other four are expanded above to ſail with: the legs of this creature are beſmeared with a ſlimy ſubſtance, by means of which it faſtens itſelf to whatever comes within its reach. Whether they move when on ſhore, Labat could never perceive, though he did every thing to make them ſtir; he only ſaw that they ſtrongly adhered to whatever ſubſtances were applied to them.

The moſt extraordinary quality in this remarkable creature, is the violent pungency of the ſlimy ſubſtance with which its legs are ſmeared. If the ſmalleſt quantity but touch the ſkin, ſo cauſtic is its quality that it burns it like hot oil dropt on the part affected. The pain is worſt in the heat of the day, but ceaſes in the cool of the evening.

It is from feeding on the galley fiſh, which is itſelf moſt potently poiſonous, that ſuch deleterious effects are the conſequence of eating many ſpecies of fiſh found about the Weſt-Indian iſlands. The galley fiſh is certainly extremely numerous all along the coaſts in the gulph of Mexico; and whenever the ſhore is covered with them in an unuſual manner, it is conſidered as a certain prognoſtic of a *ſtorm*.

The *Sepialogi*, or Ink Fiſh, has been placed by Linnæus among worms; others have elevated it among fiſh; but Dr. Monro is of opinion that it may more juſtly be conſidered as a link between theſe two claſſes of beings.

The ink-bag is ſituated on the fore ſide of the liver, of a conical ſhape, and conſiderable ſize; and from its ſituation and connection, the anatomiſt was inclined to think that the ink was the gall of the animal. Yet, as in this caſe, the bile does not ſerve any of the purpoſes aſſigned to it, but is thrown out merely to aſſiſt the animal in its eſcape, there is ſome reaſon to ſuſpect, that one principle uſe of the liver in the human fabric, may be to drain off from the conſtitution ſome matter that is hurtful to it, or that the bile is an excrementitious liquor.

## BONY, OR SPINOUS FISH.

THE tails of all the fiſh that form this diviſion are placed perpendicularly to the body: they have a compleat bony covering to their gills, through which they breathe air and water; and their muſcles are ſupported by bones, or ſpines, that are ſharp and thorny. The haddock is one of this diviſion that beſt correſponds with the definition we have made. The great reſemblance among all the genera of this diviſion, renders their natural hiſtory very ſimilar: they all live by rapine, each devouring ſuch of the inferior tribes as fall in their way by accident, or are overtaken by purſuit; they neither bring forth their young alive, like the cetaceous kind, nor produce them from diſtinct eggs, like the cartilaginous, but depoſit a ſpawn, that is prolific to an aſtoniſhing degree. An ingenious French writer, who undertook to eſtimate the number of eggs, or peas as they are more generally called, in the roe of a moderate ſized cod, and which he accompliſhed by accurately weighing and counting a ſmall portion, found the aggregate to be no leſs than nine millions three hundred and forty thouſand.

The moſt obvious circumſtance in which theſe fiſh differ from the preceding claſſes, is their bony conſtruction, which when ſlightly examined, appear to be entirely ſolid; but when viewed more cloſely will be found hollow and filled with a ſubſtance leſs rancid and oily than marrow: they are very numerous, and pointed; and are the props or ſtays to which the muſcles are attached for giving motion to the various parts of the body.

The ſkeleton of a fiſh has its members regularly diſpoſed, and every bone is placed with as much preciſion as in the orders of a regular fabric. The number, indeed, depends on the number of fins by which they move in the water; conſequently thoſe fiſh where they are moſt numerous muſt be moſt bony. In the larger kinds, the quantity of fleſh abounds, and the bones themſelves are ſo large, that they are eaſily ſeen and ſeparated; but in the ſmaller kinds with many fins, the bones are as numerous as in the great; yet, being ſo very minute, they lurk almoſt in every part of the fleſh, and are dangerous as well as troubleſome to be eaten.

In other words, fiſh that are large, fat, and have few fins, are conſtantly the leaſt bony; thoſe, on the contrary, that are ſmall, lean, and have many fins, are the moſt ſo. The roach, for inſtance, appears more bony than the carp, merely becauſe it is leaner and ſmaller; though it is more bony than an eel, having a greater number of fins.

It is the ſpinous claſs alone of the aquatic tribe of animals that ſome modern naturaliſts, perhaps too much attached to *ſyſtem* will admit to be fiſh:—but to this diſtinction, the generality of mankind will not ſo readily ſubſcribe. The ſpinous claſs certainly partake leſs of the quadruped in their formation than the others; and therefore they can ſupport exiſtence for a ſhorter time out of their own element. Their ſenſe of a change of element is evidently and ſpeedily teſtified by a palpitation more violent and at quicker and cloſer intervals; our thin air will not allow proper play, or rather exerciſe, for their lungs, and in general they live but for a few minutes.

Some, however, are able to retain their vivacioufneſs for a greater length of time:—the vital principle of the eel, we experimentally know, will remain many hours after it has been taken out of the water; and carp has been known to be fattened in a damp celler, and continue in good health for a fortnight together. It has from hence been inferred, that the want of moiſture in the gills is the chief cauſe of the death of theſe animals; and could that be ſupplied, it is ſuppoſed life might be prolonged in the air almoſt as long as in their native element.

It was a philoſophical queſtion propoſed to the Royal Society, in a merry mood, by its facetious founder, Charles II.—"How comes it that fiſh, which are bred in a ſalt element, have yet no taſte thereof, or that any is capable of being extracted from them?" The problem is yet unſolved: and it appears indeed impoſſible to account for the different operations of the ſame element upon animals that to appearance have the ſame conformation: fiſh that live in our lakes and ponds cannot bear the ſalt water ; and to ſome kinds that are bred in the ſea freſh water is immediate deſtruction.

The ſaline quality of the ſea water cannot by any means be admitted as the cauſe ; ſince, as the monarch abovementioned juſtly remarked, that no fiſh imbibe any of the ſea's ſaltneſs with their food, or in reſpiration. The fleſh of all the aquatic race is equally freſh, both in the river, and at the ſalteſt parts of the ocean ; the ſalt of the element in which they live no way mixing with their conſtitution.

An hypotheſis has been framed to account for this phenomenon, from the ſuperior weight of the ſea-water ; as from the great quantity of ſalt diſſolved in its compoſition, it is much heavier than freſh water ; ſo it is probable it lies with greater force upon the organs of reſpiration, and gives them their proper and neceſſary play :—on the other hand, thoſe fiſh which are uſed only to freſh water, cannot bear the weight of the ſaline fluid, and expire in a manner ſuffocated in the groſſneſs of the ſtrange element.

The reader has already been informed that the claſs of which we are now diſcourſing, is produced from ſpawn : the exceptions are few ;

the eel and the blenny, however, are known to bring forth their young alive.

Bowlher, who has written expreſsly on this ſubject, relates that an eel, which was opened in the preſence of ſeveral reſpectable witneſſes, was found to have an infinite number of little creatures cloſely wrapped up together in a lump, about the ſize of a nutmeg, which being put into a baſon of water, ſoon ſeparated and ſwam about.

In oppoſition to this it has been ſuggeſted, whether theſe animals may not have worms generated in their bodies; for there are ſcarce any fiſh that are not infeſted with worms in the ſame manner.

In what manner impregnation is performed on the eggs of fiſh, is wholly unknown to us. In ponds, the ſexes are often ſeen together among the long graſs at the edge of the water, ſtruggling, and apparently in a ſtate of ſuffering. They ſoon afterwards grow thin, loſe their appetites, their fleſh becomes flabby, their ſcales become rough, and they loſe their luſtre. When this period is over, their appetites return, they re-aſſume their natural agility, and their ſcales become brilliant and beautiful.

Fiſh depoſit their ſpawn at different ſeaſons of the year; thoſe which inhabit the depths of the ocean are ſaid to choose the winter months: in general, however, thoſe with which we are acquainted chooſe the ſummer ſeaſon, and prefer ſuch water as is ſomewhat warmed by the ſun-beams. After having depoſited their burthen, they return to their former ſtations, and leave their progeny to ſhift for themſelves.

The cetaceous claſs nurſe their young with conſtant care, and protect them from every injury: the cartilaginous, though incapable of nurſing their offspring, yet defend them with courage and activity: but the heedleſs and hungry tribe we are now deſcribing leave their ſpawn without any protection, and forget all connection at their departure.

Yet the production and continuation of their ſpecies ſeems the moſt important buſineſs of their lives; and there is no danger which they will not encounter, even to the ſurmounting precipices, to find a proper place for the depoſition of their future offspring.

The power of increaſing in fiſh exceeds our idea, as it would in a ſhort time outſtrip all calculation. A ſingle herring, if ſuffered to multiply unmoleſted and undiminiſhed for twenty years, would ſhew a progeny greater in bulk than ten times our globe. But happily, the balance of nature is exactly preſerved; and their conſumption is equal to their fecundity. It ſhould ſeem alſo that there is ſomething more favourable to the fecundity of fiſh in the ocean, than in an element leſs impregnated with ſalt; for thoſe of the ocean exceed the inhabitants of lakes and rivers, in point of progeny, in the proportion of twenty to one; nor do they leſs exceed them in ſize and ſtrength. Indeed it is obvious that, in freſh water, fiſh abate much of their courage and rapacity; purſue each other with leſs violence, and ſeem to be leſs powerfully actuated by all their appetites.

In the propagation of fiſh, as indeed of every part of animated nature, ſome degree of warmth ſeems abſolutely neceſſary: the ſpawn is therefore always depoſited in thoſe places where the ſun-beams may reach them, either at the bottom of ſhallow ſhores, or floating on the ſurface in deep waters. But a ſmall degree of heat anſwers all the purpoſes of incubation; and the animal iſſues into life, *perhaps*, in a ſtate of perfect formation, and never to undergo any ſucceeding change.

We ſay *perhaps*, becauſe it is not improbable that fiſh may ſuffer ſome ſlight change after their excluſion from the egg. This change is known to take place in the frog tribe, and many of the lizard kind, which are produced from the egg in an imperfect form. The tadpole or young frog, with its enormous head and ſlender tail is well known; a ſpecies of the lizard alſo, which is excluded from the ſhell, without legs, only acquires them by degrees, and not till after ſome time does it put off its ſerpent form.

It is a general rule in nature, that the larger the animals are, the longer they continue before excluſion; and this holds good with reſpect to the pea or ſpawn of the ſpinous fiſh. To aſſign a cauſe for this well known truth, is not ſo eaſy an undertaking: placing probability in the ſtead of certainty, we might ſay, that as all large bodies take a longer time to grow hot than ſmall ones, ſo the larger the egg, the larger influence of vital warmth it requires to reach through all its receſſes, and to unfold the dormant ſprings that wait to be put in motion.

Duhabel remarks to us, that fiſh are a conſiderable time in coming to their full growth; and that they are a long time deſtroyed before it comes to their turn to be deſtroyers. For with reſpect to the growth of fiſh, it is obſerved that, among carps particularly, they grow to about the ſize of the leaf of a willow-tree in the firſt year; at two years they are about four inches long; and ſeven after the fifth. From that time to eight years old, they are found to be large in proportion to the goodneſs of the pond, and from eight to twelve inches in length.

In regard to ſea-fiſh, the ſame authority, ſtrengthened by that of the fiſhermen, aſſures us, that a fiſh muſt be ſix years old before it is fit to be ſerved up to table. They inſtance it in the growth of a mackerel; and aſſure us, that thoſe a year old are as large as one's finger; that thoſe of two years are twice that length; at three and four years they are that ſmall kind of mackerel that have neither melts nor roes; and between five and ſix they are thoſe full-grown fiſh that are ſerved up at our tables.

In the ſame manner with regard to flat-fiſh, we are told that turbot and barbel at one year are about the ſize of a crown-piece; the ſecond year as large as the palm of one's hand; and in the fifth and ſixth years large enough to furniſh a handſome diſh.

The change of ſeaſons ſeems to have its influence on fiſh as well as on other claſſes of animals: in winter their appetites ſeem entirely to forſake them; at leaſt they continue in ſo torpid a ſtate, that few baits will tempt them to their deſtruction. They then forſake the ſhallow water, and ſeek thoſe deep holes to be found in every river, where they continue for a length of time without ever appearing to move. The cold evidently affects them; for in that ſeaſon they lie cloſe to the bottom, where the water is moſt warm, and ſeldom venture out, except the day be peculiarly fine, and the ſhallows at the edge of the ſtream become warmed by the powerful rays of the ſun.

It is aſſerted by Goldſmith, "that ſome fiſh "may be rendered ſo torpid by the cold in the "northern rivers, as to be frozen up in the "great maſs of ice, in which they continue for "ſeveral months together, ſeemingly without "life or ſenſation, the priſoners of congelation, "and waiting the approach of a warmer ſun, "to reſtore them at once to life and liberty.— "Thus that chearful luminary not only diſtributes health and vegetation to the productions of the earth, but is ardently ſought even "by the gelid inhabitants of the water."

Fiſh, like all other created beings are ſubject to infirmity and diſorder. We have juſt inſtanced their ſuffering from intenſity of cold; but there are certain diſpoſitions in the element in which they reſide unfavourable to their health and propagation. In ſome ponds they will not breed, however well ſituate and ſupplied with every neceſſary for their convenience and ſupport. Some ſeaſons are liable to epidemic contagions; and the fiſh are ſeen dead by the water ſide, without any apparent cauſe.

Among their infirmities we have to notice, that almoſt every ſpecies is infeſted with worms of different kinds peculiar to itſelf. When fiſh are healthy and fat, they are not much annoyed by them; but in winter, and after ſpawning time, when they are lean and ſickly, they are very great ſufferers. Theſe vermin lodge themſelves either in the jaws, and the inteſtines internally, or near the fins without. The great fins abound with them, nor are the little ones entirely free.

It is a fact pretty generally known, that the cetaceous and cartilaginous claſſes of fiſh bear no proportion in point of number to that of the ſpinous, of which there are already known above four hundred ſpecies: ſo that the number of the former make not above a fifth part of the finny creation.

From the great variety in this claſs, the mind muſt be perplexed and bewildered in deſcribing or remembering even a part of what it contains. Syſtems have been therefore deviſed to obviate this inconvenience, and regulate the confuſion, by throwing into one group or diviſion ſeveral fiſh that agree in many particulars; and thus enabling the mind to comprehend all, when offered in larger maſſes to its conſideration.

It is very properly obſerved that of all animated beings, fiſh moſt demand a ſyſtematical arrangement: birds, in their reſpective genera, ſeldom vary in ſize; quadrupeds are not ſo numerous but that they are well known; but no ſize can diſcriminate, where the ſame animal may be ten inches or ten feet in length; ſomething of preciſion muſt be therefore adapted to give us the idea of an animal whoſe hiſtory we are purſuing.

Artedi and Linnæus have long ſtood very high as the formers of ſyſtems; but ſyſtems are always arbitrary, and conſequently fluctuating; the laſt is generally therefore in higheſt eſtimation.

M. Gouan, a naturaliſt of much celebrity at Montpellier, has been happy enough by an union of thoſe of the two former, to adapt an arrangement not only preciſely ſyſtematical, but in ſome meaſure adopted by nature itſelf. Such a ſyſtem deſerves the attention of every one who wiſhes to arrange his ideas; and as ſuch we ſhall lay the outlines of it before our readers; though afterwards, in giving a more minute hiſtory of the different ſpecies, we ſhall not feel ourſelves compelled to deviate from the method already purſued of following the chain of nature.

M. Gouan has ſo far adopted this method in regard of the ſpinous claſs, that he has arranged them under the two general diviſions of prickly-finned fiſh, and ſoft-finned fiſh.

For the ſubdiviſions, following the obſervations of Linnæus, he has attended to the ſituation of the fins.

The ventral or belly fins, which are thoſe particularly to be remarked, are either wholly wanting, as in the eel, and then the fiſh is called *apodal.*

The ventral fins are placed more forward than the pectoral fins, as in the haddock, and then it is called a *jugular fiſh.*

The ventral fins are placed directly under the pectoral fins, as in the father-laſher, and then it becomes a *thoracic fiſh*.

Laſtly, the ventral fins are placed nearer the tail than the pectoral fins, as in the minnow, and then it is an *abdominal fiſh*.

Theſe characters are ſtrongly marked, and may be eaſily remembered, and of theſe the French naturaliſt has formed two grand diviſions, which he arranges as follow:

### FIRST DIVISION:
### PRICKLY-FINNED FISH.

1. Prickly-finned Apodal Fiſh; thoſe wanting the ventral fins.
2. Prickly-finned Jugular Fiſh; ventral fins more forward than the pectoral.
3. Prickly-finned Thoracic Fiſh; ventral fins directly under the pectoral.
4. Prickly-finned Abdominal Fiſh; ventral fins nearer the tail than the pectoral.

### SECOND DIVISION:
### SOFT-FINNED FISH.

1. Soft-finned Apodal Fiſh; characterized as the foregoing firſt ſub-diviſion.
2. Soft-finned Jugular Fiſh; correſponding as above:—and ſo of the reſt.
3. Prickly-finned Thoracic Fiſh.
4. Soft-finned Abdominal Fiſh.

It now remains, after a few preliminary obſervations, to divide the preceeding arrangement into ſuch tribes as are moſt ſtrongly marked by nature, and to give the diſtinct characters of each, to make a very complete and very ſimple ſyſtem; and to give the young naturaliſt a tolerable idea of the FORM of every kind of ſpinous fiſh; yet the hiſtory and nature of the animal itſelf can be obtained only from experience and obſervation.

To explain the nature of his ſyſtem, and render the utility of it more apparent, M. Gouan gives the following examples:—"Suppoſe, ſays he, I meet with a fiſh, the name to me unknown, of which I deſire to know ſomething more. The way is, firſt, to ſee whether it be cartilaginous fiſh, which may be known by its wanting fins to open and ſhut the gills, which the cartilaginous kind are wholly without. If I find that it has them, than it is a ſpinous fiſh; and, in order to know its kind, I examine its fins, whether they be prickly or ſoft: I find them ſoft; it is therefore to be ranked among the ſoft-finned fiſh. I next examine its ventral, or belly-fins, and finding that the fiſh has them, I look for their ſituation, and find they be nearer to the tail than to the pectoral fins. By this I find the animal to be a ſoft-finned abdominal fiſh. Then to know which of the kinds of theſe fiſh it is, I examine its figure and the ſhape of its head. I find the body rather oblong ; the head with a ſmall beak ; the lower jaw like a ſaw ; the fin covering the gills with eight rays, This animal muſt therefore be the herring, or one of that family ; ſuch as the pilchard, the ſprat, the ſhad, or the anchovy.

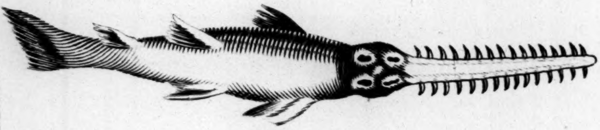
"To give another inſtance ; upon examining the fins of a fiſh to me unknown, I find them prickly ; I then look for the ſituation of the ventral fins ; I find them entirely wanting : this, then, muſt be a prickly-finned apodal fiſh. Of this kind there are but three, and, by comparing the fiſh with the deſcription, I find either of the trichurus kind, the ſword-fiſh, or the gilt-head. Upon examining alſo its internal ſtructure, I ſhall find a very great ſimilitude between my fiſh and that placed at the head of the family.

## DIVISION I.

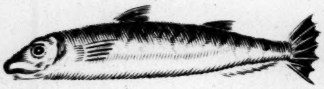
### PRICKLY-FINNED FISH.

### SECT. I.—PRICKLY-FINNED APODAL FISH.

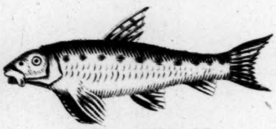
1. The *Trichurus*. The body of this fiſh is of a ſword-like form ; the head oblong ; the



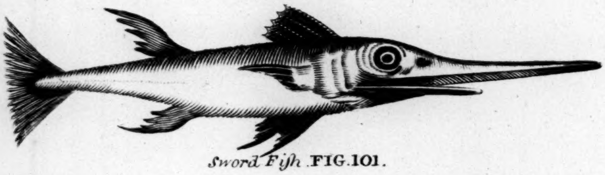
*Saw Fish* FIG.102.



*Mackrell*.FIG.105.



*Gudgeon*.FIG.103.



*Sword Fiſh* .FIG.101.

*Tunny*.FIG.106.

*Turbot*.FIG.104.

the teeth ſword-like, bearded at the points; the fore teeth largeſt; the fins covering the gills have ſeven ſpines; the tail ending in a point without fins.

This fiſh is of a beautiful ſilvery white, is found about the ſhores of India, and particularly near China, where it will leap into the fiſhermens' baſkets. It is alſo found in ſome parts of America.

2. The *Xiphias* or *Sword-fiſh*. The body is round, the head long, the upper jaw terminating by a long beak in form of a ſword, and the fin that covers the gills have ſix ſpines.

3. The *Dorada*, *Gilt-head*, or *Ophidium*, and by ſailors called the *Dolphin*. The body ſword-like; the head blunt; the fin covering the gill with ſeven ſpines; the mouth opens ſideways; the fins of the back, the anus, and tail, all joining together.

### SECT. II.—PRICKLY-FINNED JUGULAR FISH.

4. The *Trechinus*, or Weaver. The body is oblong, the head obtuſe; the bones covering the gills jagged at the bottom; the fins covering the gills with ſix ſpines; the anus near the breaſt. The fiſh buries itſelf in the ſands, leaving only its noſe out; and if trodden upon, immediately ſtrikes with the ſpines that form its

dorſal fins, which are venomous and dangerous.

5. The *Uranoſcopus*. The body is formed like a wedge; the head is almoſt round, and larger than the body, with eyes on the top of it; the mouth flat; the fin covering the gills with five ſpines, and the anus in the middle of the body. This fiſh is chiefly found in the Mediterranean ſea.

6. The *Callionemous*, or *Dragonet*. The body is alſo of the wedge-form; the head is broad, and larger than the body; the mouth even with the body; the upper lip doubled up; the bony covering of the gills ſhut cloſe; the opening to which is behind the head; the fin that covers the gills has ſix ſpines. It is an inhabitant of the Atlantic.

7. The *Blennius*, or *Blenny*; one ſpecies of which is of the viviparous kind. The body is oblong; the head ſlanting or declining to one ſide; the teeth a ſingle range; the gills covered with a fin conſiſting of ſix ſpines; and the ventral fins having two ſmall blunt bones in each.

### SECT. III.—PRICKLY-FINNED THORACIC FISH.

8. The *Gobius*, or *Gudgeon*. The body round and oblong; the head with two little

holes between the eyes, one before the other; the fin covering the gill with ſix ſpines; the ventral fins joined together. The Gudgeon, as well as the *Cotcus*, or *Bull-head*, is uſually placed under the head *Cyprinus*.

9. The *Cepola*. The body ſword-like; the head blunt; the mouth flat; the fin covering the gills with ſix ſpines; the fins diſtinct; an inhabitant of the Mediterranean Sea.

10. The *Coryphæna*, or *Razor-fiſh*. The body wedge-like; the head very bevil; the fin covering the gills with five ſpines.

11. The *Scomber*, or *Mackerel*. The body oblong; the line running down the ſide zig-zagged towards the tail; the head ſharp and ſmall; the fins covering the gills with ſix ſpines; ſeveral falſe fins towards the tail.

12. The *Labrus*, or *Wraſſe*. The body oval; the head middling; the lips doubled inward; both cutting and grinding teeth; the covers of the gills ſcaly; the fin covering the gills with five ſpines; the pectoral fins pointed.

13. The *Sparus*, or *Sea-bream*. The body oblong; the head middling; the lips not inverted; the teeth cutting and grinding; the cover of the gills ſcaly; the fins covering

the gills with five rays; the pectoral fins pointed.

14. The *Chætodon*, or *Cat-fiſh*. The body oblong; the head ſmall; teeth ſlender and bending; the fins covering the gills with five or ſix ſpines; the fins of the back and anus ſcaly.

15. The *Sciæna*. The body nearly eliptical; the head bevil; the covers of the fins ſcaly; the fin covering the gills with ſix rays; the fins of the back jagged, and hidden in a furrow in the back.

16. The *Perch*. The body oblong; the head bevil; the covers of the gills ſcaly and toothed; the fin covering the gills with ſeven ſpines; the fins in ſome jagged.

17. The *Scorpæna*, or *Father-laſher*. The body oblong; the head great, with beards; the covers of the gills armed with prickles; the fin covering the gills with ſeven ſpines.

18. The *Mullus*, or *Surmulet*. The body ſlender; the head almoſt four-cornered; the fin covering the gills with three ſpines; ſome of theſe have beards; a fiſh highly prized by the Romans, and ſtill conſidered as a very great delicacy.

19. The *Trigla*, or the *Gurnard*. The body ſlender; the head nearly four-cornered, and covered

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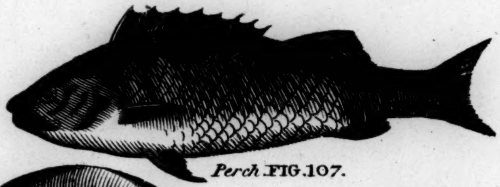
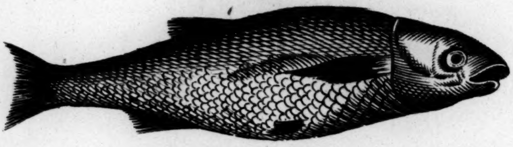


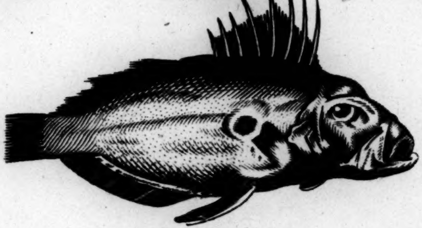
*Perch.* FIG. 107.

*Lamprey.* 111.



*Mullet.* 109.

*Eel.* 110.



*John Doree.* 108.

vered with a bony coat; the fin covering the gills with ſeven ſpines; the pectoral and ventral fins, ſtrengthened with additional muſcles and bones, and very large for the animal's ſize.

20. The *Cottus*, or *Bull-head*. The body wedge-like; the head flat and broader than the body; the fin covering the gills with ſix ſpines; the head furniſhed with prickles, knobs, and beards.

21. The *Zeus*, or *Doree*. The body oblong; the head large, bevil; the fin covering the gills with ſeven rays; the fins jagged; the upper jaw with a looſe floating ſkin depending into the mouth.

22. The *Trachipterus*, or *Sabre*. The body ſword-like; the head bevil; the fin covering the gills with ſix ſpines; the lateral line ſtraight; the ſcales in a ſingle order; a looſe ſkin in both the jaws.

23. The *Gaſteroſteus*, or *Stickleback*. The body broadeſt towards the tail; the head oblong; the fin covering the gills with three ſpines; prickles ſtarting backward before the back fins and the fins of the anus.

PRICKLY-FINNED ABDOMINAL FISH.

25. The *Silurus*, or *Sheat-Fiſh*. The body oblong; the head large; the fin covering the

gills from four to fourteen ſpines; the leading bones or ſpines in the back and pectoral fins toothed.

25. The *Mugil,* or *Mullet.* The body oblong; the head almoſt conical; the upper jaw with a furrow, which receives the prominence of the under; the fin covering the gills with ſeven rays.

26. The *Polynemus.* The body oblong; the head with a beak; the fin covering the gills with from five to ſeven ſpines: the bones that move the pectoral fins not articulated to thoſe fins. This would ſeem rather to be a ſpecies of the *Exocetas*: as will appear afterwards in the particular deſcription of the Flying-fiſh.

27. The *Theutys.* The body almoſt elliptical; the head abruptly ſhortened; the fin covering the gills with five rays; the teeth in a ſingle row, cloſe, ſtrong, and even.

28. The *E ops,* or *Sea-ſerpent.* The body ſlender; the head large; the fin covering the gills double with thirty ſpines, and armed externally with five bones reſembling teeth.

### DIVISION II.

### SOFT-FINNED FISH.

### SECT. I.—SOFT-FINNED APODAL FISH.

29. The *Muræna*, or *Eel*. The body round and ſlender; the head terminating in a beak; the fin covering the gills with ten rays; the opening to the gills pipe-faſhion, placed near the pectoral fins; the fins of the back, the anus, and the tail, united in one.

30. The *Gymnotus*, or *Carapo*. The body broadeſt on the back, like the blade of a knife; the head ſmall; the fin covering the gills with five rays: the back without a fin; two beards or filaments from the upper lip; an inhabitant of Braſil.

31. The *Anarhicas*, or *Wolf-fiſh*. The body roundiſh and ſlender; the head large and blunt; the fore-teeth above and below conical; the grinding teeth and thoſe in the palate round; the fin covering the gill has ſix rays.

32. The *Stromateus*. The body oblong; the head ſmall; the teeth moderately ſharp; the fin covering the gill with five or ſix rays.

33. The *Ammodytes*, or *Launce*. The body ſlender and roundiſh; the head terminated by a beak; the teeth of a hair-like fineneſs: the fin covering the gills with ſeven rays.

### SECT II.—SOFT-FINNED JUGULAR FISH.

34. The *Lepadogaſter.* The body wedge-like; the head oblong, forwarder than the body, flattiſh, the beak reſembling that of a duck; the pectoral fins double, two on each ſide; the ventral joined together; a kind of bony breaſt-plate between the pectoral fins; the fin covering the gills with five rays; the opening to the gills pipe-faſhion.

35. The *Gadus*, or *Cod-fiſh.* The body oblong; the head wedge-like; the fin covering the gills with ſeven rays; ſeveral back and anal fins.

### SECT. III.—SOFT-FINNED THORACIC FISH.

36. The *Plemonecles*, or *Flumide.* The body elliptical; the head ſmall; both eyes on one ſide of the head; the fin covering the gills with from four to ſeven rays.

37. The *Echeneis*, or *Sucking-fiſh.* The body almoſt wedge-like, moderately round; the head broader than the body; the fin covering the gills with ten rays; an oval breaſt-plate, ſtreaked in form of a ladder, toothed.

38. The *Lipidopus*, or the *Garter-fiſh.* The body ſword-like: the head lengthened out, the fins covering the gills with ſeven rays; three ſcales only on the whole body; two in the place

of the ventral fins; the third from that of the anus.

SOFT-FINNED ABDOMINAL FISH.

39. The *Loricaria*. The body cruſted over; the head broad, with a beak; no teeth; the fin covering the gills with ſix rays.

40. The *Atherina*, or *Atherine*. The body oblong; the head of a middling ſize; the lips indented; the fin covering the gills with ſix rays; the line on the ſides reſembling a ſilver band.

41. The *Salmo*, or *Salmon*. The body oblong; the head a little ſharp; the fin covering the gills from four to ten rays; the laſt fin on the back without its correſpondent muſcles, fat.

42. The *Fiſtularia*. The body angular, in form of a ſpindle: the head pipe-faſhion, with a beak; the fin covering the gills with ſeven rays; the under jaw covering the upper.

43. The *Eſox*, or *Pike*. The body round; the head with a beak; the under-jaw pierced longitudinally with ſmall holes; the fin covering the gills with from ſeven to twelve rays.

44. The *Argentina*, or *Argentine*. The body a little round and ſlender; the head with a beak,

beak, broader than the body; the fin covering the gills with eight rays; a ſpurious back fin.

45. The *Clupea*, or *Herring*. The body a little oblong; the head with a ſmall beak; the fin covering the gills with eight rays.

46. The *Evocetas*, or *Flying Fiſh*. The body oblong; the head almoſt three-cornered; the fin covering the gills with ten rays; the pectoral fins placed high, and as long as the whole body; the back fin at the extremity of the back.

47. The *Cyprinus*, or *Carp*. The body elongated, almoſt round; the head with a ſmall beak; the hinder part of the head covering the gills, marked with a creſcent; the fin covering the gills with three rays.

48. The *Cobitis*, or *Loach*. The body oblong: almoſt equally broad throughout; the head ſmall, a little elongated; the eyes in the hinder part of the head; the fin covering the gills from four to ſix rays; the covers of the gills cloſed below.

49. The *Amia*, or *Bonito*. The body round and ſlender: the head, forehead, and breaſt, without ſkin; the fin covering the gills with twelve rays; two beards from the noſe.

50. The *Mormyrus*. The body oblong; the head lengthened; the gill covering fin has a ſingle ray; the opening to the gills is linear, and has no bone covering them.

Having given this copious view of Gouan's ſyſtem, for the convenience of thoſe who may wiſh to make ichthyology a ſcience, we ſhall conclude with a definition of two very important words, frequently made by naturaliſts of every claſs.

GENUS, in natural hiſtory, is a ſubdiviſion of any claſs or order of natural beings, whether of the animal, vegetable, or mineral kingdoms, all agreeing in certain common characters.

The genera of animals ought to be eſtabliſhed upon the moſt natural, obvious and diſtinctive characters. The genera of fiſh are founded on a certain agreement between a number of ſpecies, ariſing from the ſimilitude of their eſſential external parts, which always conſiſt in the ſituation of theſe parts, for the moſt part alſo in number, and frequently in their figure and proportion.

The word SPECIES has been very accurately defined by Artedi, in the ſcience of ichthyology: —"Every fiſh, ſays he, which differs from all the other fiſh of the ſame genus, in ſome external part, whether that difference be in exceſs or defect, in number or proportion, or even in colour, provided that the difference be fixed and invariable, is properly to be called a diſtinct ſpecies.

The ſpecific differences of fiſh are to be drawn from theſe circumſtances; but it is not to be ſuppoſed that every ſpecies differs in all of them; ſometimes only one, ſometimes more, occaſion the variation.

If any one fiſh, in regard to all the others of the ſame genus, is found to be poſſeſſed of ſome external part which they all want, as for example, if it have tubercles in the ſhape of horns on the head, ſpines or prickles in the head, or any other part of the body, the fiſh is then to be eſteemed a diſtinct ſpecies.

If one fiſh differs from the others of the ſame genus, in the number of any parts, as fins, ſpines, or tubercles, it is then alſo a diſtinct ſpecies.

If one fiſh differs from another in the proportion of any eſſential part, as in the having longer jaws, longer teeth, or the like, it is alſo to be eſteemed a truly different ſpecies.

If one fiſh differs from another in the figure of ſome eſſential part, as if the ſnout, the back, the teeth, or the tail, or the lateral lines, it is to be eſteemed a diſtinct ſpecies.

If one fiſh differs from another of the ſame genus in the exceſs of parts, having ſome part that is deficient in the other; or if in number, proportion, or figure of ſome of the eſſential parts, the diſtinction will be the more evident as the greater number of parts differ, and the ſpecies will be eaſily found to be diſtinct.

With this elementary aſſiſtance to the ſcientific knowledge of fiſh, we now proceed to the hiſtory of ſuch individuals as are beſt known and aſcertained.

## THE XIPHIAS, OR SWORD FISH.

THIS fiſh is from fifteen to twenty-five feet long, and very thick in proportion to its length: It is found in moſt parts that are frequented by whales, to which it is a moſt terrible enemy. At the ſight of this animal, ſay navigators, the whale ſeems agitated in an extraordinary manner, leaping from the water as if with affright: wherever it appears, the whale perceives it at a diſtance, and flies from it in the oppoſite direction. The whale has no inſtrument of defence except its tail, with which it endeavours to ſtrike the enemy; and a ſingle blow taking place, would effectually deſtroy its adverſary: but the ſword-fiſh is as active as the other is ſtrong, and eaſily avoids the ſtroke; then bounding into the air, it falls upon its enemy, and endeavours not to pierce with its pointed beak, but to cut it with its toothed edges. The ſea all about is ſoon dyed with blood, proceeding from the wounds of the whale; while the enormous animal vainly endeavours to reach its invader, and ſtrikes with its tail againſt the ſurface of the water, making a report at each blow louder than the noiſe of a cannon.

## THE DORADA

IS one of the moſt beautiful, moſt active, and moſt voracious of the ſpinous kind; they are in a ſtate of continual warfare, always employed either in defending themſelves againſt the ſhark, or darting after the ſmaller fiſh. It is chiefly found in the tropical climates, is about ſix feet long, yet not thicker than a ſalmon, and, furniſhed with a full complement of fins, cuts its way through the water with amazing rapidity.—Its eyes are placed on each ſide of the head, large and beautiful, ſurrounded with circles of ſhining gold. The back enamelled all over with ſpots of a bluiſh green and ſilver; the tail and fins of a gold colour, and all together poſſeſſing ſuch a brilliancy of tint as nothing but Nature's pencil could produce.

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## THE ANARRHICAS LUPUS, OR SEA-WOLF

SEEMS to be confined to the northern part of the globe. We find it in the ſea of Greenland; in thoſe of Iceland and Norway; on the coaſts of Scotland and of Yorkſhire; and laſtly, in that part of the German ocean which waſhes the ſhores of Holland; the moſt ſouthern of its haunts that we can with any certainty mention.

It is a moſt ravenous and fierce fiſh, and when taken, faſtens on any thing within its reach: the fiſhermen, dreading its bite, endeavour, as ſoon as poſſible, to beat out its fore teeth, and then kill it by ſtriking it behind the head. Schonevelde relates, that its bite is ſo hard, that it will ſeize on an anchor, and leave the marks of its teeth in it; and the Daniſh and German names of *Steenbider* and *Steinbeiſſer*, expreſs the ſenſe of its great ſtrength, as if it was capable of cruſhing even ſtones with its jaws.

It feeds almoſt entirely on cruſtaceous animals, and ſhell-fiſh, ſuch as crabs, lobſters, prawns, muſcles, ſcollops, large whelks, &c. theſe it grinds to pieces with its teeth, and ſwallows with the leſſer ſhells. It does not appear they are diſſolved in the ſtomach, but are voided with the fæces; for which purpoſe the aperture of the anus is wider than in other fiſh of the ſame ſize.

It is full of roe in February, March, and April, and ſpawns in May and June.

This fiſh has ſo diſagreeable and horrid an appearance that nobody at Scarborough, except the fiſhermen, will eat it, and they prefer it to holibut. They always before dreſſing take off the head and ſkin.

The ſea-wolf grows to a large ſize: thoſe on the Yorkſhire coaſt are ſometimes found of the length of four feet; according to Dr. Johnſon, they have been taken near Shetland ſeven feet long, and even more.

The head is a little flatted on the top; the noſe blunt; the noſtrils are very ſmall; the eyes ſmall, and placed near the end of the noſe.

The teeth are very remarkable, and finely adapted to its way of life. The fore teeth are ſtrong, conical, diverging a little from each other, ſtand far out of the jaws, and are commonly ſix above and the ſame below, though ſometimes there are only five in each jaw; theſe are ſupported within ſide by a row of leſſer teeth, which makes the number in the upper jaw 17 or 18, in the lower 11 or 12.

The ſides of the under jaw are convex inwards, which greatly adds to their ſtrength, and at the ſame time allows room for the large muſcles with which the head of this fiſh is furniſhed. The *dentes molares*, or grinding teeth of the under jaw, are higher on the outer than the inner edges, which inclines their ſurfaces inward; they join to the canine teeth in that jaw, but in the upper are ſeparate from them. In the centre are two rows of flat ſtrong teeth, fixed on an oblong baſis upon the bones of the palate and noſe. The teeth of the anarrhicus are often found foſſil; and in that ſtate called *bufonites*, or *toad-ſtones:* theſe were formerly much eſteemed for their imaginary virtues, and were ſet in gold, and worn as rings.

The two bones that form the under jaw are united before by a looſe cartilage; which mechaniſm, admitting of a motion from ſide to ſide, moſt evidently contributes to the deſign of the whole, viz. a facility of breaking, grinding, and comminuting, its teſtaceous and cruſtaceous food. At the entrance of the gullet, above and below, are echinated bones: theſe are very ſmall, being the leſs neceſſary, as the food is in a great meaſure comminuted in the mouth by aid of the grinders.

The body is long, and a little compreſſed ſideways; the ſkin ſmooth and ſlippery; it wants the lateral line. The pectoral fins conſiſt of 18 rays. The dorſal fin extends from the hind part of the head to the tail; the rays in the freſh fiſh are not viſible. The anal fin extends as far as the dorſal fin. The tail is round at its end, and conſiſts of 13 rays. The ſides, back, and fins, are of a livid lead colour; the two firſt marked downwards with irregular obſcure duſky lines; theſe in different fiſh have different appearances. The young are of a greeniſh caſt, reſembling the ſea-wrack, amongſt which they reſide for ſome time after their birth.

## THE CHAETODON, OR CAT FISH.

THE body is oblong, the head ſmall, the teeth ſlender, very numerous and flexile; the rays of the gill five or ſix; the fins of the back and anus ſcaly.

There are twenty-three ſpecies, diſtinguiſhed from each other principally by the figure of the tail, and number of ſpines in the back fin.

The moſt remarkable is the roſtratus, or ſhooting fiſh, of Linnæus, having a hollow cylindrical beak. The following account of this fiſh, under a different name, is given by a writer of credit.

The *jaculator*, or darting fiſh, is an inhabitant of the Indian ſea, and derives its name from the extraordinary manner of obtaining its food.

The fiſh is of the ſize of a carp, the body covered with large ſcales, the head alſo is ſcaly, and the lower jaw projects; the eyes are large, and the iris of a golden colour; the whole body is likewiſe of a golden hue, like that of the carp, except the back, which verges to a brown, and is marked with five dark brown tranſverſe equidiſtant ſpots on either ſide, the firſt at the temples, the laſt near the tail.

The jaculator frequents the ſhores and ſides of the ſeas or rivers in queſt of food. When he intends to catch a fly, or any other inſect which he ſees at a diſtance, he approaches very ſlowly and cautiouſly, and comes as much as poſſible perpendicularly under the object; the body being put in an oblique ſituation more or leſs, and the mouth and eyes being near the ſurface of the water, the jaculator ſtays a moment quite immoveable, having its eyes fixed directly on the object, and then begins to ſhoot, without ever ſhewing its mouth above the ſurface of the water, out of which a ſingle drop ſhot at the object ſeems to ariſe, which never fails ſtriking the fly into the ſea, where it ſoon becomes the prey of the fiſh.

This relation is authorized by the experiment of M. *Hommel*, governor of Batavia in 1776, who had curioſity to be convinced of the truth by ocular demonſtration. For this purpoſe he had a large wide tun filled with ſea water, then had ſome of the fiſh caught and put into it, changing,

ing the water every other day. In a while they ſeemed reconciled to their confinement. A ſlender ſtick with a fly pinned on its end, was placed in ſuch a direction on the ſide of the veſſel, as the fiſh could ſtrike it. It was with inexpreſſible delight that the governor ſaw theſe fiſh exerciſing their ſkill in ſhooting at the fly with an amazing velocity, and never miſſing the mark. With the cloſeſt attention he never could ſee any part of the mouth out of the water, though he often ſaw the fiſh ſhoot a great many drops one after another, without leaving its place and fixed ſituation.

## THE CALLIONYMOUS.

THE upper lip of this fiſh is doubled up; the eyes are very near each other: and the belly fins at a great diſtance.

There are three ſpecies of callionymous.

1. The *lyra*, with the firſt bone of the back fin as long as the body of the animal. It is found as far north as Norway and Spitzbergen, and as far ſouth as the Mediterranean Sea; and is not unfrequent on the Scarborough coaſt, where it is taken by the hook in thirty or forty fathoms water.

2. The *dranunculus* with the firſt bone of the back fin ſhorter than its body, which is of a ſpotted yellow. It frequents the ſhores of Genoa and Rome.

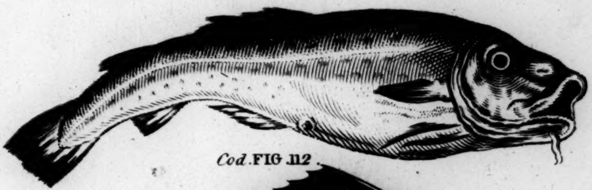
3. The *indicus* has a ſmooth head with longitudinal wrinkles; the lower jaw is a little longer than the upper one; the body of a livid colour; the anus in the middle of the body. It is a native of Aſia.

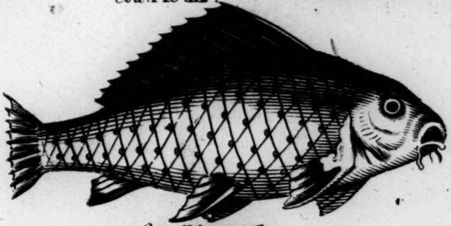
## THE SALMON.

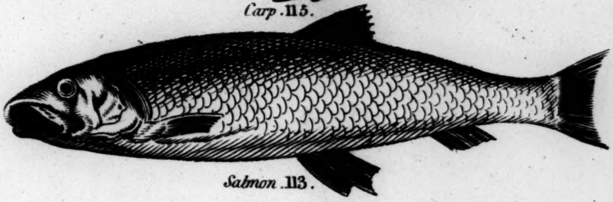
THIS is a ſoft-finned abdominal fiſh; and diſtinguiſhed from others of the truttaceous kind by the following characters; it is of an oblong body covered with very ſmall ſcales, a ſmall head, a ſharp noſe, and forked tail; its back is bluiſh, the reſt of the body reddiſh, though the belly part is paler, or whitiſh, and the whole is uſually ſpotted. Its under jaw is bent upward, and that ſometimes ſo much as to make itſelf a ſinus in the upper by conſtant motion, and ſometimes to perforate it.

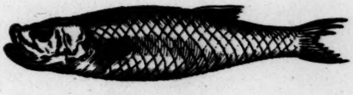
The ſalmon is firſt produced from its parent ſpawn in freſh rivers; thence it goes into the ſea, to acquire its growth and feed; and at the time of its full growth, and in the ſeaſon for ſpawning, it removes into the freſh waters again.

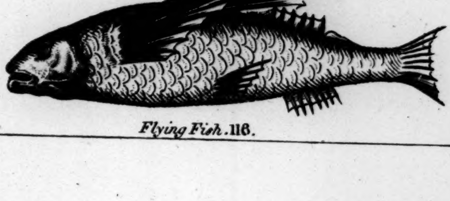
People who are accuſtomed to view ſalmon, can diſcover the difference of ſex at firſt ſight, by the head of the *he* fiſh being much larger than


Cod. FIG. 112.


Carp. 115.


Salmon. 113.


Herring. 114.


Flying Fish. 116.

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than that of the *ſhe* fiſh, and when full grown, the former has a knob on the point of the lower jaw.

In the latter end of the year, the ſalmon makes as far up the river as poſſible in order to ſpawn; and when they meet with a place ſuitable, the male and female conjunctly form a hole in the ſand or gravel, about eighteen inches deep, wherein they caſt their ſperm together, and carefully cover it over with the ſame materials, where it continues till the ſpring, if not diſturbed by the winter's flood.—One of the two roes of the *ſhe* fiſh will at this ſeaſon be ſometimes twelve inches in length, and ſix in circumference.

It is remarkable, that ſo far as obſervation has been able to trace them at any time, the ſame ſhoals of ſalmon always return into the ſame river out of which they ſwam, and not into any other; ſo that the people who live on the ſalmon fiſhery are not afraid for their rivers being cleared, by all the fiſh in them going down into the ſea, for they know that they will all return to them again at a proper time.

When the ſalmon is once entered a freſh river, he always ſwims up againſt the ſtream, and often will go a hundred leagues in the large and long rivers; and the people at this vaſt diſtance from the mouth have the pleaſure of taking a fiſh that is properly in part of the ſea kind. And it is ſomewhat ſingular, ſays *Des Landes*, that the rivers which moſt abound with ſalmon, do not make the ſeas about their mouths any more abound with them than others; for inſtance, the harbour of Breſt affords no ſalmon, though the river Chateaulin, which diſcharges itſelf into it, is the richeſt ſalmon river in France.

Neither do ſalmon equally frequent all rivers, though they may ſeem to us equally proper for their reception. There are two rivers which open themſelves into the harbour of Breſt, very near to each other; the one of theſe is famous for the quantity of ſalmon in it; and the great advantages ariſing therefrom;—in the other, theſe fiſh are never ſeen. The cauſe moſt probably is, their finding plenty of food, and proper places for depoſiting their ſpawn in the one of theſe rivers, and not in the other, that makes this regular choice.

The depoſiting the ſpawn ſeems one of the moſt important acts in the life of a ſalmon; and there is no danger which they will not encounter,

counter, even to the ſurmounting precipices, to find a proper place for the purpoſe: and they not only brave the danger of various enemies, but alſo ſpring up cataracts as high as a houſe.

When they come to the bottom of a torrent, they ſeem diſappointed to meet the obſtruction, and ſwim ſome paces back; they then take a view of the danger that lies before them, ſurvey it motionleſs for ſome minutes,—advance, and again retreat; till at laſt ſummoning up all their force, the take a leap from the bottom; their body ſtraight and ſtrongly in motion, and thus moſt frequently clear every obſtruction.

Another ſingularity regarding the ſalmon, is their ſwimming up the rivers together in ſuch vaſt numbers. It is to be allowed, indeed, that herring, mackerel, and many other fiſh, do in the ſame manner appear on the coaſt at certain ſeaſons in prodigious numbers; but the reaſons for their coming together in theſe quantities are much more eaſily explained than that of the ſalmon's doing ſo. The herrings when they come in ſuch prodigious ſhoals to the coaſt of Britain and France, have been found to be allured thither in theſe numbers by a prodigious quantity of a particular ſort of ſea worms, which are their favorite food, and which are found to cover the whole ſurface of the ſea at that time.

Rondelletius has deſcribed theſe inſects under the name of ſea-caterpillars; they always appear in the months of June, July, and Auguſt, which are the herring ſeaſon in thoſe parts of the world; and probably the ſame cauſe will be found to bring them in other places, if ſufficiently enquired into, as theſe and ſome other fiſh come to certain places in ſhoals, to get food.— But the ſalmon do it in order to propagate their ſpecies. The ſpawn of the ſalmon is never depoſited but in rivers, and at the time that theſe fiſh are found in the rivers, it is only with this intent: the females go firſt and the males follow as far as the others pleaſe to lead them, which is uſually to ſome convenient place in ſhallow water, where the ſpawn, when depoſited, is not buried under too great a quantity of water, but has the advantage of a continual warmth from the ſun's beams.

About the latter end of March, or beginning of April, the young fry ſhow themſelves alive, very ſmall at firſt, but gradually arrive at the ſize of four inches in length, and are then termed, (in the North at leaſt) *ſmouters*, or properly ſmelts, though deſtitute of any affinity in colour or ſhape to that delicate morſel with which a diſh of Newcaſtle ſalmon is decorated at the London tables. This young fry haſten to ſea with great expedition ; for about the middle of May, the rivers where they breed ſeem to be alive.

About the middle of June in the following ſeaſon, the earlieſt of them take the river again, being increaſed to 12, 14, or 16 inches long, and in this ſecond ſtage are called *gilſes*. Thus they increaſe in numbers and ſize till about the middle of July ; during which time they are taken in great numbers ; the following ſeaſon they become well grown ſalmon.

The popular opinion that the fiſh, commonly called the ſalmon-trout, being a young ſalmon, is generally deemed ill-founded. In the river Tweed they are called whitlings, and are certainly a diſtinct ſpecies of fiſh, though reſembling the ſalmon in ſcales, ſhape, and colour. Their flavour, when freſh taken, is very delicious, and much ſuperior to all other trout, without exception. They are thought to be peculiar to the main body of the Tweed, and not generating in, or frequenting its branches.

There is alſo in the Tweed, another kind of trout, called the *bull-trout*, of a large ſize, and proportionably longer than the whitling. This trout is found only in the months of January and February; often weighing twelve pounds, and is ſold in London, during theſe early months, for ſalmon.

Another ſpecies of ſmall fiſh is found in thoſe rivers that abound with ſalmon, and is commonly known by the name of Par-fiſh. They appear in the month of April, and continue till November, during which time they increaſe from two or three inches to five or ſix. They are caught with worms, or the artificial fly. They are moſt probably the ſame fiſh with the Samlett of the Wye, and the Samſon of the Severn, both of which they reſemble perfectly in ſhape and colour; and the ſame notion prevails in reſpect to them as of the par, that they are only of the male ſex.

But the opinion of their being the fry of the ſalmon, or elſe an abortive production of that fiſh which does not breed, ſeems to be clearly negatived by Mr. Pennant: To this may be added, that near the river of Aber, in Carnarvonſhire, a ſmall ſtream falls perpendicularly from a rock 300 feet high : above this fall, the fiſh called par, ſamlett, or ſamſon, are in great plenty, but no ſalmon was ever ſeen above the cataract ; conſequently the ſpecies in queſtion, which are extremely numerous, and conſtantly breed there, cannot be either the *abortive* or *mature* offspring of that fiſh.

The ſcarcity of ſalmon which has of late years prevailed in Worceſter, has been attributed to fly-fiſhing ; for they were in ſuch quantities formerly, that there are many old indentures now in Worceſter, by which it is covenanted that apprentices ſhall not be compelled to eat ſalmon more than twice a week, as is now the caſe with the ploughmen in Devonſhire, and the fiſhermens' boys at North Shields.

## CAPELAR.

THIS fiſh is deſcribed by Walcott under the name of *Salmo Arcticus*. It ſwarms, he ſays, on the coaſts of Newfoundland, Greenland, and Iceland ;

Iceland; lives moſtly at ſea, and comes into bays only in the months of May, June, and July, to breed. The females enter firſt, and depoſit their roe on the ſea-plants The males follow to milt. At this time the number makes the water look black and curled. They are taken by dipping ſmall nets faſtened to a hoop at the end of a pole. When freſh caught they have the ſmell of a cucumber. At Newfoundland they are called *capelan*, and are preſerved in brine, as baits for the cod fiſhery:---in Iceland, Lodua, and in Greenland, *angmarſet*, where they dry them on the rocks, and make them ſupply the place of bread.

The head of this fiſh is ſmall, lower jaw longeſt; body ſlender; the lateral line formed by a ridge of ſhort briſtles; the gill covers black; back, a dull green; ſides and belly ſilvery white, dotted with black; the belly often tinged with violet; firſt dorſal fin is in the middle of the back; the ſecond broad and truncated at top; pectoral fins large, and ſituated very low; tail forked; length ſix inches. The female wants the black on the gill covers; and the lateral line is ſmooth.

From the appellation given to it by Mr. Walcott, we have given it place next to the ſalmon.

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## THE TUNNY.

THE Tunny is often known by the name of the Spaniſh Mackerel; its technical name *thynnus*; it is common in the Mediterranean and other ſeas, but is not frequently caught on the Engliſh coaſt.

The tunny is a very large fiſh, growing ſometimes to ſeven or eight feet long, and more than an hundred weight. It is of a rounded and thick body, growing gradually ſmall towards the tail, until it is at length extremely ſlender. It very much reſembles the pelamis in its whole figure, but that it wants the oblong black ſtreaks which that fiſh has on its ſides, and is much larger. The back is black, or if held in ſome lights, is of a ſhining bluiſh or greeniſh hue: the belly, and half the ſides, of a ſilvery whiteneſs: the ſcales are very ſmall, the ſnout pointed; the jaws both of equal length, and armed each with one row of teeth.

The mouth is large and black within, except that part of the palate is red. The eyes are large; the larger black fins are two in number, the foremoſt placed near the head, and riſing out of a cavity in the back, and the other at a ſmall diſtance behind that; and in ſome fiſh of this ſpecies, of a reddiſh, or yellowiſh colour; behind this laſt there are eight, nine, or ten ſmall fins running down the ridge of the back, at equal diſtances, to the tail, which is very forked. The fins at the gills are black, ſmall, and terminate in a point. The belly-fins are placed but at a ſmall diſtance behind theſe, and are alſo ſmall; and both theſe and the gill-fins have ſinuſſes in the body of the fiſh, into which they may be depreſſed.

Behind the anus is a fin like that on the back, and behind it eight more ſmall ones, anſwering to thoſe on the back alſo; and the ſkin of the ſides near the tail is extended into two fins, ſo that this part of the fiſh looks as if it were ſquare.

This fiſh is much eſteemed at the table, eſpecially in Spain and Italy, where it is ſalted in vaſt quantities.

Mr. Swinburn, in his Travels through Italy, gives the following remarks on theſe fiſh, and the method of taking them:

" The nets," ſays he, " are ſpread over a " large ſpace of ſea, by means of cables faſten- " ed to anchors, and are divided into ſeveral " compartments. The entrance is always di- " rected, according to the ſeaſon, towards the " part of the ſea from which the fiſh are known " to come. A man placed upon the ſummit " of a rock, high above the water, gives the " ſignal of the fiſh being arrived; for he can " diſcern from that elevation what paſſes under " water infinitely better than any perſon nearer " the ſurface. As ſoon as notice is given that " the ſhoal of fiſh has penerated as far as the " inner compartment, or the chamber of death, " the paſſage is drawn cloſe, and the ſlaughter " begins.

" The tunny belongs to Linnæus's ſcomber " among the thoracici; and enters the Medi- " terranean about the vernal equinox, travel- " ling in a triangular phalanx, ſo as to cut " the waters with its point, and to preſent an " extenſive baſe for the tides and the currents " to ſet againſt, and impel forwards. Theſe " fiſh repair to the warm ſeas of Greece to " ſpawn, ſteering their courſe thither along the " European ſhores; but as they return, ap- " proach the African coaſt; the young fry is

" placed in the van of the ſquadron as they
" travel. They come back from the Eaſt in
" May, and abound on the coaſt of Sicily and
" Calabria about that time.

" In autumn they ſteer northward, and fre-
" quent the neighbourhood of Almiſi and Na-
" ples; but during the whole ſeaſon ſtrag-
" glers are occaſionally caught. When taken
" in May, they are full of ſpawn, and their
" fleſh is then eſteemed unwholeſome, apt to
" occaſion headachs and vapours; the milts
" and roes are particularly ſo at that ſeaſon.
" To prevent theſe bad effects, the natives fry
" them in oil, and afterwards ſalt them. The
" quantity of theſe fiſh conſumed annually in
" the two Sicilies almoſt exceeds the bounds of
" calculation. From the beginning of May to
" the end of October it is eaten freſh, and all
" the reſt of the year it is in uſe ſalted. The
" moſt delicate part is the muzzle. The belly
" ſalted was called *tarantellum*, and accounted
" a great delicacy by the Romans; its preſent
" name is *ſurra*. The reſt of the body is cut
" into ſlices, and put into tubs."

## THE COD.

THIS is the largeſt of a genus of fiſh, named by ſome authors Aſſelli, and by others Gadus. The chief characters by which the cod is diſtinguiſhed are as follows:

The colour on the back and ſides is a duſky olive, variegated with yellow ſpots; its belly is white; its ſides have a long white line running their whole length, from the gills to the tail, which at the abdomen is curved, but elſewhere is ſtraight; its ſcales are very ſmall, and adhere firmly to the ſkin; its eyes are large; at the angle of the lower jaws, there hangs a ſingle beard, which is ſhort, ſeldom exceeding a finger's length; its tongue is broad; it has ſeveral rows of teeth as in the pike; and in the palate, near the orifice of the ſtomach, and near the gills, it has ſmall cluſters of teeth. It has three back fins, two at the gills, and two at the breaſt, and two others behind the anus; and the tail is plain.

The cod may not improperly be placed at the head of the migrating or wandering tribe of fiſh. It is a native of the Northern world, and its places of reſidence are the banks of Newfoundland, and the other ſand-banks that lie off Cape Breton; which, together, form an extenſive flat of above five hundred miles in extent, and ſurrounded by a deeper ſea. Hither they repair annually in numbers beyond the power of calculation, to feed on the quantity of worms that are to be found there in the ſandy bottom. On theſe banks they are taken in ſuch numbers, that they ſupply all Europe with a conſiderable ſhare of proviſions. The fiſhermen take them with their line, as faſt as they can throw it; and have ſtages erected all along the ſhore for ſalting and drying them. The beſt, largeſt, and fatteſt cod, are thoſe taken on the South-ſide of the great bank, which is a kind of ſubmarine mountain, one hundred and fifty leagues long; thoſe on the North-ſide are much ſmaller.

The immenſe captures of cod fiſh at Newfoundland makes but a ſmall diminution, when compared to their numbers; and when their proviſion is exhauſted there, or the ſeaſon for propagation returns, they go off to the polar ſeas, where they depoſit their ſpawn in full ſecurity:

curity: from whence again want of food forces them, as ſoon as the firſt more ſouthern ſeas are open, to repair ſouthward for ſubſiſtence. Nor is this fiſh an unfrequent viſitant upon our own ſhores;—but the returns are not ſo regular, nor does the captures bear any proportion to thoſe at Newfoundland.

The *Haddock* is a ſpecies of the Gadus, or Cod, with a bearded mouth, and three fins on the back; the upper jaw longeſt, and the tail a little forked.

The *Whiting* is another ſpecies of the cod, but without a beard.—Both theſe ſpecies are frequent in our ſeas, and much eſteemed at our tables.

The haddock and the whiting are perhaps driven upon our ſhores rather by their fears than by their appetites. Their migrations, however, are regularly conducted, and their appearance perfectly conſtant.

## THE CLUPEA, OR HERRING,

OF which the body is oblong; the head with a ſmall beak; the gill-covering fin has eight rays; the belly fins frequently nine rays; and a ſcaly ſerrated line runs along the body from head to tail. There are eleven ſpecies.

1. The *Common Herring* has no ſpots, and the under jaw is longer than the upper one.—This fiſh was unknown to the ancients, as it is ſeldom, if ever, found ſoutherly. A herring dies immediately after it is taken out of the water; for this reaſon, perhaps, they are incomparably better when dreſſed as ſoon as caught, than on the following day.

Herrings are found from the higheſt northern latitudes yet known as low as the northern coaſts of France, beyond which they are rarely ſeen. On the American coaſt they are met with in vaſt ſhoals as low as Carolina; and ſuch is the annual inundation of them in Cheſſapeak, that they become abſolutely a nuiſance:

they are alſo found in the ſeas of Kamtſchatka, and probably they reach Japan. But their great rendezvous is within the arctic circle, where they continue for months to recruit themſelves after the fatigue of ſpawning; thoſe ſeas within that ſpace ſwarming with inſect food in a far greater degree than that of our warmer latitudes.

The immenſe ſhoals that viſit our coaſts put themſelves in motion in the ſpring, and begin to appear off the Shetland iſlands in April and May; yet theſe are only the fore-runners of the *grand army*, (ſo the Dutch denominate them) that come in June, and whoſe extent is ſuch as to alter the very appearance of the ocean: this body being uſually divided into diſtinct columns, of five or ſix miles in length, and three or four in breadth. In fine weather they reflect a variety of ſplendid colours like a field of variegated gems; ſometimes driving the water before them with a kind of ripling noiſe—ſometimes ſinking for the ſpace of ten or fifteen minutes, and then riſing again to the ſurface.

The herrings are full of roe at the time they arrive upon our coaſts, and continue in perfection till the beginning of winter, when they depoſit their ſpawn. The young herrings begin to approach the ſhores in July and Auguſt, and are then from half an inch to two inches long. Some of the old herrings continue on our coaſt the whole year; but the numbers that remain admit of no compariſon with thoſe that return: the young ones alſo are ſaid to purſue the ſame courſe, and return to their parental haunts beneath the ice, to repair the deſtruction of their race made during the ſummer, and to obtain a ſafe retreat from their numerous enemies.

The more immediate cauſe of migration is variouſly accounted for: *Leuwenhoeck* ſays, that the Channel every year teems with an innumerable quantity of worms, and little fiſh, on which the herrings feed; that they are a kind of *manna*, which theſe fiſh come punctually to gather up: and when they have entirely cleared the ſeas in the Northern parts of Europe, they deſcend towards the South, where they are invited by a new ſtock of proviſions. *Anderſon* is of opinion that they would never depart from their moſt deſirable retreat in their icy, northern intrenchments, did not their numbers render it neceſſary for them to migrate; and as with bees from a hive, they are compelled to ſeek for other retreats.

Another opinion is, that they remove for the ſake of depoſiting their ſpawn in warmer ſeas, that will mature and vivify it more aſſuredly than thoſe of the frozen zone. Deficiency of food cannot be ſo effectually the motive, as they come to us full of fat, and on their return are almoſt univerſally obſerved to be lean and miſerable. What their food is near the Pole, we are not informed; but, in our ſeas, they feed much on cruſtaceous inſects, and ſometimes on their own fry.

This partial migration, viewed in a moral light, muſt excite our veneration and awe for that Mighty Power which originally impreſſed thoſe creatures with an inſtinct that tends to bleſs and enrich theſe iſlands; and which cauſes them at certain and invariable times to quit the vaſt polar deeps, and offer themſelves to our expecting fleets.

On their firſt irruption from their Northern hives, they are ſurrounded by innumerable enemies, all uniting in their deſtruction: numerous flocks of the polar ſea-fowls watch the outſet of their migration, and ſpread extenſive ruin; the fin-fiſh, the cachalot, the porpeſſe, the grampus, and the ſhark, find them an eaſy prey, and thin their ſquadrons by millions, and from theſe depredators they have no other means of ſafety than crowding cloſe together, and leaving the outmoſt bands the danger of being firſt devoured; or by approaching the firſt ſhores they can find, which, to the ſquadron holding an eaſtern courſe, is Iceland, where they cover an extent of ſhore not leſs than the iſland itſelf.

The firſt oppoſition met with in their journey ſouthward, is from the Shetland iſles, which divide the eaſtern army again into two parts, and where the fiſhermen, prepared for their reception, take ſometimes two thouſand barrels at a ſingle draught. From hence they paſs the Weſtern ſhores of Britain, and fill every bay and creek with their numbers: others advance towards Yarmouth, the great and ancient mart of herrings; and paſſing through the Britiſh channel, in a great degree diſappear. From the Shetland iſlets, and after viſiting the Hebrides, a body proceeds to the north of Ireland, to feed and rejoice the inhabitants of moſt of the coaſts that border on the Iriſh ſea. But thoſe brigades, as we may call them, thus ſeparated from the greater columns, are often capricious in their motions, and do not ſhew an invariable attachment to their haunts.

Indeed it appears from one circumſtance that theſe creatures are governed by a choice in reſpect of the ſhores they pitch upon: or that having fixed upon a ſhore, they will frequent it for ſeveral ſeaſons, or indeed for ſeveral ages, and then moſt capriciouſly forſake it. For ſome ages the ſhores of Norway were the reſort for herrings, as the banks of Newfoundland are for cod; and thouſands of European ſhips reſorted thither. But ſome ſhort time previous to the year 1600, they forſook the Norwegian coaſts, and made the ſhores of Germany their annual reſort, where the Hanſe-towns derived much advantage from their capture and ſale. For above a century, however, their greateſt colonies have viſited the Britiſh channel, and the Iriſh ſhores; though for their apparently capricious deſertion it will not be eaſy to aſſign a cauſe. This we may obſerve, that from the earlieſt accounts of time, the bleſſing of their annual viſitation has never been withdrawn from the whole, though it may have been denied to particulars.

2. The *Sprat* is a native of the European ſeas, greatly reſembling the herring, though a good deal ſmaller, and having thirteen rays in the back fin. They are caught in the Thames

from the beginning of November till March, and afford a very ſeaſonable relief to the poor of the metropolis. They are ſometimes pickled, and rendered in flavor ſcarcely inferior to anchovies; from which they are only to be diſtinguiſhed by their bones being indiſſoluble. At Yarmouth they are cured like red herrings.

3. The *Aloſa*, or *Shad*, has a forked ſnout, and black ſpots on its ſides: it frequents the river Thames about the latter end of May, or the beginning of June, and is conſidered a very coarſe and inſipid fiſh. But the Severn affords this fiſh in very great perfection, and on its firſt appearance, which is uſually in May, or in very warm ſeaſons in April, it is eſteemed a delicacy, eſpecially in that part of the river that flows near Glouceſter, where they are taken in nets, and often ſell dearer than ſalmon. The London fiſhmongers diſtinguiſh the Severn from the Thames ſhad, by calling the former *aloſe*: The old fiſh come from the ſea into the river in full roe, but where they ſpawn is not determined, for their fry has not yet been aſcertained. The Severn ſhad is ſometimes, though rarely, caught in the Thames, and is called by the fiſhermen *allis*, (properly *aloſe*). They continue in the Severn about two months, and

are ſucceeded by a variety called the *twaite*, which is taken in great numbers, but held in as little regard as the ſhad of the Thames. The chief difference between theſe varieties are, that the twaite has three or four black ſpots on the ſides, placed one under the other: if only one ſpot, it is always near the gill. The weight of the ſhad is ſeldom leſs than four pounds; that of the twaite never exceeds two. Ancient naturaliſts ſay, that the ſhad is a fiſh of paſſage in the Nile; that it is alſo found in the Mediterranean, near Smyrna, and on the coaſt of Egypt, near Roſetto; and that in the months of December and January it aſcends the Nile as high as Cairo, where the people ſtuff it with pot-marjoram; and when dreſſed in that manner, it will nearly intoxicate the eater.

4. The *Encraſicolus*, or *Anchovy*, is about three inches long, and has its upper jaw longer than the under. They are taken in vaſt quantities in the Mediterranean, and are brought over here pickled. The great fiſhery is at Georgia, a ſmall iſle weſtward of Leghorn.

Mr. Walcott deſcribes the anchovy as follows:—"The noſe," ſays he, "is pointed; "edge of the jaws finely ſerrated; eyes large; "body round and ſlender; back of a duſky

“ green colour ; ſides and belly of a ſilvery
“ white ; between the ventral fins a long
“ pointed ſcale ; tail forked ; length ſix inches
“ and a half.

“ At different ſeaſons it frequents the At-
“ lantic ocean and the Mediterranean ſea ; paſ-
“ ſing through the Straights of Gibraltar to-
“ wards the Levant in the months of May,
“ June, and July. The greateſt fiſhery is at
“ Gorgona a ſmall weſt iſle of Leghorn, where
“ they are taken at night in nets, into which
“ they are allured by lights fixed to the ſtern of
“ the veſſels. When cured, their heads are
“ cut off, their gall and guts taken out, and
“ then ſalted and packed in barrels ; it ſcarce
“ needs be mentioned, that, being put on the
“ fire, they diſſolve in almoſt any liquor : they
“ are well taſted when freſh.”

5. The *Sinenſis* is very like the common herring, but broader ; it has no teeth, and is a native of China.

6. The *Atherinoides* has a ſhining line on each ſide, and ſmall belly-fins ; is a native of Surinam.

7. The *Sima* has yellow fins ; the mouth is flat, the upper jaw very ſhort, and the body of a ſhining ſilver colour :—it is a native of Aſia.

8. The *Thriſſa*;—9. *Sternicla*;—10. *Myſtus*;—11. *Tropica*, are natives of the Indian world, but afford little intereſt or amuſement in their particular delineation.

## THE CARP.

THE mouth of this fiſh is toothleſs; there are three rays in the gills; and the belly-fins have frequently nine rays. The term *cyprinus* is uſed as a generic name to this fiſh, of which naturaliſts have enumerated thirty one ſpecies, principally diſtinguiſhed by the number of rays in the vent fin.

The carp was introduced into England about the year 1514, by Leonard Maſchal, to whom we are likewiſe indebted for that excellent apple the *pepin*. Ruſſia wants theſe fiſh at this day; and Sweden has them only in the ponds of people of faſhion. They chiefly abound in the rivers and lakes of Poliſh Pruſſia, where they are ſometimes taken of a vaſt ſize. They are there a great article of commerce, and ſent in well-boats to Sweden and Ruſſia. The merchants purchaſe them out of the waters of the nobleſſe of the country, who draw a good revenue from this article. They are found ſometimes alſo in the harbour of Dantzic.

Carp are very long lived. Geſner relates an inſtance of one that was near an hundred years old. They alſo grow to ſuch a ſize, that authors ſpeak of carp weighing 200 pounds weight, and five feet in length. The carp is a prodigious breeder; its quantity of roe has been found ſometimes ſo great, that when taken out, and weighed againſt the fiſh itſelf, the former has been found to preponderate.

From the ſpawn of this fiſh, caviare is made for the Jews, who hold the ſturgeon in abhorrence. The carp is extremely cunning, and on that account is ſometimes ſtyled the *river-fox*. They will ſometimes leap over the nets, and eſcape that way; at other times, they will immerſe themſelves ſo deep in the mud as to let the net paſs over them. They are alſo very ſhy in taking a bait; yet at the ſpawning time they are ſo ſimple as to ſuffer themſelves to be tickled, handled, and caught by any body who will attempt it.

This fiſh is apt to mix its milt with the roe of other fiſh; from which is produced a ſpurious breed, as has been obſerved in the offſpring of the carp and tench, which bore the greateſt reſemblance to the firſt. The ſame has alſo been obſerved of the carp and bream.

Mr. J. Rheinhold Forſter, in the Philoſophical Tranſactions for 1771, Art. 37, gives us the following obſervations on the ſubject of Carp:—

" In Poliſh Pruſſia," ſays he, " and many " other parts of Germany, the ſale of carp " conſtitutes a part of the revenue of the nobility and gentry; ſo that the proper management of that fiſh is reduced to a kind of " ſyſtem, founded on the experience of ſeveral " generations. The author here communicates all the particulars which he has been " able to collect from the practice of theſe experienced breeders and feeders of carp, and " from his own obſervation. He recollects to " have ſeen ſome of theſe fiſh, thus treated and " maintained, above a yard long, and of 25 " pounds weight; but had no opportunity of " aſcertaining their age. In the pond, however, at Charlottenburg, he adds, a palace " belonging to the king of Pruſſia, I ſaw more

" than two or three hundred carp, between two " and three feet long; and I was told by the " keeper they were between 50 and 60 years " ſtanding. They were tame, and came to " the ſhore in order to be fed; they ſwallowed " with eaſe a piece of white bread of the ſize " of half a halfpenny roll."

We ſhall only add, (not certainly for the gratification of the epicure, but to aſcertain a curious fact in natural hiſtory, of which we, and poſſibly others may, have hitherto doubted) the author's teſtimony concerning the poſſibility of the carp's not only living for a conſiderable time out of water, but of its growing fat in its new element. The author has ſeen the experiment ſucceſsfully tried, and attended to the whole proceſs, in a nobleman's houſe where he then reſided, in the principality of Anhalt Deſſau. " The fiſh being taken out of the " water, is wrapped up in a large quantity of " wet moſs, ſpread on a piece of net, which " is then gathered into a purſe; in ſuch a " manner, however, as to allow him room to " breathe. The net is then plunged into water, and hung up to the ceiling of a cellar. " At firſt the dipping muſt be repeated every " three or four hours; but afterwards the carp

" need only to be plunged into the water once " in about ſix or ſeven hours. Bread ſoaked " in milk is firſt given him in ſmall quantities. " In a ſhort time the fiſh will bear more, and " grow fat under this ſeemingly unnatural " treatment."

Mr. Daines Barrington, in a note, confirms a part of the preceding account, by mentioning the practice of a certain fiſhmonger near Clare-market, who, in the winter, frequently expoſes a buſhel at leaſt of carp and tench for ſale, in the ſame dry veſſel, for ſix or ſeven hours; many of which are not ſold, and yet continue in health though breathing nothing but air, during the time above-mentioned, for ſeveral days ſucceſſively.

The carp is the moſt valuable of all kinds of fiſh for ſtocking of ponds. It is very quick in its growth, and brings forth the ſpawn three times a year, ſo that the increaſe is very great. The females do not begin to breed till eight or nine years old; ſo that in breeding-ponds a ſupply muſt be kept of carp of that age. The beſt judges allow, that in ſtocking a breeding-pond, four males ſhould be allowed to twelve females. The uſual growth of a carp is to two or three inches in length in a year;

but in ponds which receive the fattening of common ſewers, they have been known to grow from five inches to eighteen in one year. A feeding pond of one acre extent, will very well feed 300 carp of three years old, 300 of two years, and 400 of one year old. Carp delight greatly in ponds that have marley ſides; they love alſo clay-ponds well ſheltered from the winds, and grown with weeds and long graſs at the edges, which they feed upon in the hot months. Carp and tench thrive very faſt in ponds and rivers near the ſea, where the water is a little brackiſh; but they are not ſo well taſted as thoſe which live in freſh water. Grains, blood, chicken-guts, and the like, may at times be thrown into carp-ponds, to help to fatten the fiſh. To make them grow large and fat, the growth of graſs under the water ſhould by all means poſſible be encouraged. For this purpoſe, as the water decreaſes in the ſummer, the ſides of the pond left naked and dry, ſhould be well raked with an iron rake to deſtroy all the weeds, and cut up the ſurface of the earth: hay-ſeed ſhould then be ſown plentifully in theſe places; and more ground prepared in the ſame manner, as the water falls more and more away. By this means there will be a fine and plentiful growth of young graſs along the ſides of the pond to the water's edge; and when the rains fill up the pond again, this will be all buried under water, and will make a feeding place for the fiſh, where they will come early in the morning, and will fatten greatly upon what they find there.

The method of fattening carps by caſtration, is a diſcovery in epicureaniſm made by Mr. Tull, famous for his improvements in huſbandry; he communicated the ſecret to Sir Hans Sloane, in whoſe preſence he performed the operation, by cutting open the carp, and ſhewing the ovary with its canal, leading into the part called the cloaca. He then performed the operation of caſtration on a ſecond, by opening the ovary, and filling up the wound with the ſcrapings of a black hat. The caſtrated carp being put into water with ſix live ones, ſeemed only a little leſs briſk in ſwimming. The caſtrated carp is ſaid to excel the others in delicacy of flavor as much as a capon does a cock, or a fat ox exceeds a bull. The effect of caſtrating fiſh ſeems not improbable from its analogy with what we experience in land animals.

## GOLD AND SILVER FISH.

THESE are a ſpecies of carp diſtinguiſhed by the name of *Auratus Cyprinus*; a ſmall fiſh, domeſticated by the Chineſe, and generally kept for ornament by great people in their courts and gardens. They breed them in ſmall ponds made for the purpoſe; in baſons, and even in porcelain veſſels.

They were firſt introduced into England about the year 1691, but were not generally known till 1728; when a great number were brought over, and preſented firſt to Sir Matthew Decker, and by him circulated round the neighbourhood of London, from whence they have been diſtributed to moſt parts of the country.

The Golden fiſh is not bigger than our pilchard. The male is of a bright red colour from the top of the head to the middle of the body ; the reſt is of a gold colour ; but it is ſo bright and ſplendid, that the fineſt gilding, according to Father Le Compte, cannot approach it. The female is white ; but its tail and half of its body, reſemble the luſtre of ſilver.

Father du Halde, however, obſerves, that a red and white colour are not always the diſtinguiſhing marks of the male and female ; but that the females are known by ſeveral white ſpots which are ſeen round the orifices, that ſerve them as organs of hearing ; and the males, by having theſe ſpots much brighter.

Gold Fiſh are light and lively ; they love to ſport on the ſurface of the water, ſoon become familiariſed, and may even be accuſtomed to come and receive their food on ſounding a ſmall rattle. Great care is neceſſary to preſerve them ; for they are extremely delicate, and ſenſible of the leaſt injuries of the air :— a loud noiſe, ſuch as that of thunder, or cannon ; a ſtrong ſmell ; a violent ſhaking of the veſſel, or a ſingle touch, will oft times deſtroy them.

Theſe fiſh live with little nouriſhment ; thoſe ſmall worms that are engendered in the water, or the earthly particles that are mixed with it, are ſufficient for their food. The Chineſe, however, take care, from time to time, to throw into the baſon and reſervoirs, where they are kept, ſmall balls of paſte, which they are very fond of when diſſolved; they give them alſo lean pork, dried in the ſun, and reduced to a fine and delicate powder, and ſometimes ſnails: the ſlime which theſe inſects leave at the bottom of the veſſel is a great delicacy for them, and they eagerly haſten to feed on it. In winter they are removed from the court to a warm chamber, where they are generally kept ſhut up in a porcelain veſſel.

In warm countries theſe fiſh multiply faſt, provided care be taken to collect their ſpawn, which floats on the water, and which they almoſt entirely devour. This ſpawn is put into a particular veſſel expoſed to the ſun, and preſerved there until vivified by the heat. Gold-fiſh, however, ſeldom multiply when they are kept in cloſe vaſes, becauſe they are then too much confined. In order to render them fruitful, they muſt be put into reſervoirs of conſiderable depth, in ſome places at leaſt, and which are conſtantly ſupplied with freſh water.

At a certain time of the year, (ſays Groſier, in his deſcription of China), a prodigious number of barks may be ſeen in the great river Yang-tſe-hiang, which go thither to purchaſe the ſpawn of theſe fiſh. Towards the month of May, the neighbouring inhabitants ſhut up the river in ſeveral places with mats and hurdles, which occupy an extent of almoſt nine or ten leagues, and they leave only a ſpace in the middle, ſufficient for the paſſage of barks.

The ſpawn of the fiſh, which the Chineſe can diſtinguiſh at firſt ſight, although a ſtranger could perceive no traces of it in the water, is ſtopped by theſe hurdles; the water mixed with ſpawn is then drawn up, and after it has been put into large veſſels, it is ſold to merchants who tranſport it afterwards to every part of the empire. This water is ſold by meaſure, and purchaſed by thoſe who are deſirous of ſtocking their ponds and reſervoirs with fiſh.

The Gold and Silver Fiſh, though originally natives of China and Japan, yet are become ſo well reconciled to our climate, as to thrive and multiply very faſt in our ponds and ſtews. They are alſo frequently kept in glaſs bowls, in which we have an opportunity of obſerving their actions and propenſities better than we poſſibly can in their natural ſtate: nor can any thing be more amuſing than ſuch an obſervatory ; the double refractions of the glaſs and water repreſent them, when moving, in a ſhifting and changeable variety of dimenſions, ſhades and colours ; while the two mediums aſſiſted by the concavo-convex ſhape of the veſſel, magnify and diſtort them vaſtly ; not to mention, that the introduction of another element and its inhabitants, into our parlours, engages the fancy in a very agreeable manner. And this ſimple exhibition is as pleaſing as the abſurd introduction of birds apparently ſurrounded by the fiſh, is abſurd and unnatural.

Some that delight in theſe fiſh have adopted a notion that they need no aliment ; it is true indeed that they will ſubſiſt for a long time without any apparent food but what they can collect from pure water frequently changed ; yet they muſt draw ſome ſupport from animalcula, and other nouriſhment ſupplied by the water ; becauſe, though they ſeem to eat nothing, yet the conſequences of eating often drop from them ; and that they are beſt pleaſed with this jejune diet, may eaſily be confuted, ſince if you toſs them crumbs, they will ſeize them with great readineſs, not to ſay greedineſs : however, bread ſhould be given ſparingly, leſt, turning

ing ſour, it corrupt the water. They will alſo feed on the water plant *lemna*, duck's meat, and alſo on ſmall fry.

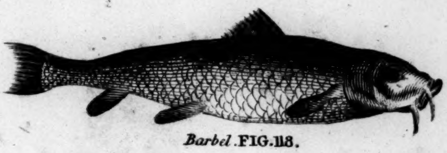
When they want to move a little, they gently protrude themſelves with their pectoral fins; but it is with their ſtrong muſcular tails only that they and all fiſh ſhoot along with ſuch inconceivable rapidity. In theſe veſſels, the dying of fiſh may be obſerved with accuracy: as ſoon as the creature ſickens, the head ſinks lower and lower, and it ſtands as it were on its head; till getting weaker, and loſing all poiſe, the tail turns over, and at laſt it floats on the ſurface of the water, with its belly uppermoſt. The reaſon why fiſh, when dead, ſwim in this manner, is obvious; becauſe, when the body is no longer balanced by the fins of the belly, the broad muſcular back preponderates by its own gravity, and turns the belly uppermoſt, as lighter, from its being a cavity, and becauſe it contains the ſwimming bladders, which contribute to render it buoyant.

It has been generally ſaid, that the eyes of fiſh are immoveable; but theſe apparently turn them forward or backward in their ſockets, as their occaſions require. They take little notice of a lighted candle, though applied cloſe to their heads, but flounce and ſeem much frightened by a ſudden ſtroke of the hand againſt the ſupport whereon the bowl is hung, eſpecially when they have been motionleſs, and are perhaps aſleep. As fiſh have no eyelids, it is not eaſy to diſcern when they are ſleeping or not, becauſe their eyes are always open.

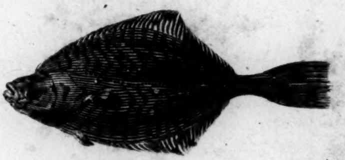
## THE BARBEL

BELONGS to the genus Cyprinus; it is about the length of three feet, and will weigh eighteen pounds; the belly white; the dorſal fin is armed with a remarkably ſtrong ſpine, ſharply ſerrated, with which it can inflict a very ſevere and dangerous wound on the incautious handler, and even do much damage to nets.

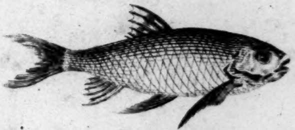
The barbel is ſo extremely coarſe as to have been overlooked by the ancients: they are the



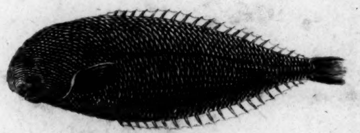
*Barbel*. FIG. 118.



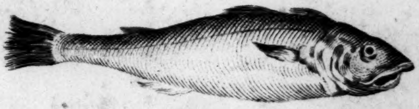
*Flounder*. 121.



*Roach*. 117.



*Soal*. 120



*Whiting*. 119.

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worſt and coarſeſt of freſh water fiſh, and ſeldom eaten but by the poorer ſort of people, who ſometimes boil them with a bit of bacon to give them a reliſh. Their roe is very noxious, affecting thoſe who eat it unwarily with a nauſea, vomiting, purging, and a ſlight ſwelling.

They frequent the ſtill and deep parts of rivers, and live in ſociety, rooting like ſwine with their noſes in the ſoft banks. The barbel is ſo tame as to ſuffer itſelf to be taken by the hand; and people have been known to take numbers by diving for them. In ſummer they move about during night in ſearch of food; but towards autumn, and during winter, confine themſelves to the deepeſt holes.

## THE TENCH

IS the Engliſh name of the *tinca* of modern authors; according to Artedi, it is a ſpecies of the carp. It is thick and bulky in proportion

portion to its length. The colour of the back is duſky; the dorſal and ventral fins of the ſame colour; the head, ſides, and belly, of a greeniſh caſt, moſt beautifully mixed with gold, which is in its greateſt ſplendor when the fiſh is in the higheſt ſeaſon. They love ſtill waters, and are rarely found in rivers; they are very fooliſh, and eaſily caught.

The tench is a well-taſted fiſh, though it lives in foul water, and ſeems to feed very coarſely. By the ancients it was held in little repute:—It is always found in the muddieſt parts of ponds, and where there are moſt weeds.

In this country it is reckoned a wholeſome and even a delicious food; but the Germans are of a different opinion:—by way of contempt they call it the *ſhoemaker*. Geſner even ſays that it is inſipid and unwholeſome. It does not commonly exceed four or five pounds in weight, though ſome have been known to weigh ten or twenty.

The ſlime of the ſkin of this fiſh is ſaid to be of a healing nature, and to cure all freſh wounds; and it is pretended that the other fiſh know this property in it, and always apply to the tench when wounded. Whether this opinion be true or falſe, the tench has obtained by it the name of the fiſh's phyſician. The pike is ſaid to pay ſuch reſpect to this fiſh, on this account, that he never ſeizes him. But theſe are things eaſier to be fancied and ſaid, than proved; and, if it ſhould prove that the pike does not eat the tench, it may be reſolved into a much more natural cauſe, by ſuppoſing the ſlime of the tench too diſagreeable in his ſtomach to ſuffer it.

## THE CHUB.

THIS fiſh is of the ſame genus with the foregoing; it is very coarſe and full of bones; frequenting the deep holes of rivers, and in ſummer commonly lies on the ſurface, beneath the ſhade of ſome tree or buſh. Some have been known to weigh eight or nine pounds.

The chub is a very timid fiſh, ſinking to the bottom on the leaſt alarm, even at the paſſing of a ſhadow, but they will ſoon reſume their ſituation. It feeds on worms, caterpillars, graſshoppers, and other coleopterous inſects that happen to fall into the water; and will even feed on cray-fiſh. It will riſe to a fly.

### THE BLEAK.

THIS fiſh is from two to five or ſix inches in length; they are very common in many of our rivers, and keep together in large ſhoals.

During the month of July, (ſay Goldſmith and Pennant) there appear in the Thames, near Blackwall and Greenwich, innumerable multitudes of ſmall fiſh, known to the Londoners by the name of *white-bait*. They are eſteemed very delicious when fried with fine flour, and occaſion, during the ceaſon, a vaſt reſort of the lower orders of epicures to the taverns at the places where they are taken. There are various ſuppoſitions concerning theſe fiſh, all of which terminate in reckoning them the frv of ſome other fiſh. Mr. Pennant thinks they are of the carp genus, though he cannot determine the ſpecies to which they belong. They certainly have a greater ſimilarity to the bleak than to any other ſpecies; yet he thinks they cannot be the young fry of that, becauſe the bleak is found in many of the Britiſh ſtreams, but the white-bait is only in the Thames.

At certain ſeaſons the bleak ſeems to be in great agonies: they tumble about near the ſurface of the water, and are incapable of ſwimming far from the place; but in about two hours they recover and diſappear. Fiſh thus affected, the Thames fiſhermen call *mad* bleaks.

They ſeem alſo to be troubled with a ſpecies of *gordias*, or hair-worm, that they riſe to the ſurface and die.

## THE GUDGEON.

THE body round; the head broader than the body, with two little holes between the eyes; one before the other; the gill-membrane with ſix ſpines. Of ſix ſpecies, the two chief are,

1. The Gobio, or river bull-head, is very common in all our clear brooks; it lies almoſt always at the bottom, or under a ſtone: it depoſits its ſpawn in a hole which it forms among the gravel, and quits it with great reluctance. It feeds on water inſects. Redi ſays that this fiſh has no air-bladder. It ſeldom exceeds the length of three inches and a half. The head is large, broad, flat, and thin at its circumference, being well adapted for inſinuating itſelf under ſtones: on the middle part of the covers of the gills is a ſmall crooked ſpine, turning inwards. The eyes are very ſmall; the irides yellow; the body grows ſlender towards the tail, and is very ſmooth. The colour of this fiſh is as diſagreeable as its form, being duſky, mixed with a dirty yellow; the belly whitiſh. The taſte, however, is excellent.

2. The Scorpio, or Father-laſher, is not uncommon on the rocky coaſts of this iſland; it lurks under ſtones, and will take a bait.—It ſeldom exceeds eight or nine inches in length. The head is large, and has a moſt formidable appearance, being armed with vaſt ſpines, which it can oppoſe to any enemy that

attacks it, by ſwelling out its cheeks and gill-covers to a large ſize. The noſe, and ſpace contiguous to the eyes, are furniſhed with ſhort ſharp ſpines; the covers of the gills are terminated by exceeding long ones, which are ſtrong, and very ſharp pointed. The mouth is large; the jaws covered with very ſmall teeth; the roof of the mouth is furniſhed with a triangular ſpot of very minute teeth.

This ſpecies is very frequent in the Newfoundland ſeas, where it is called *ſcolping*; it is alſo as common on the coaſt of Greenland, in deep water near the ſhore. It is a principal food of the natives, and the ſoup made of it is ſaid to be agreeable as well as wholeſome.

## CORYPHÆNA.

THERE are twelve ſpecies of this fiſh, moſt of them natives of foreign ſeas. The general characters are, the head is declined and truncated; the membrane covering the gills has ſix rays, and the back fin runs the whole length of the back. The moſt remarkable are the blue and parrot fiſh.

The *Blue Fiſh* is deſcribed by Cateſby as having its head of a very odd ſtructure, reſembling that of the ſpermaceti whale; the mouth is ſmall, each mandible armed with a ſingle row of even teeth, ſo cloſely joined, that they ſeem entire bones; the iris of the eye is red. On the back is a long pliant fin, ſomewhat indented on the edge; behind the gills are two fins, one under the abdomen, and another behind the anus. The tail is forked, and the whole fiſh entirely blue. They are taken on the coaſts of the Bahama iſlands, and in moſt of the ſeas between the tropics.

The *Parrot Fiſh* has a large mouth, paved as it were with blunt teeth, cloſely connected, after the manner of the ſea-wolf. The body is covered with large green ſcales; the eyes are red and yellow; the upper part of the head brown, the lower part and the gills blue, bordered with a duſky red; a ſtreak of red extends from the throat behind the gills, at the upper end of which is a bright yellow ſpot. The fins are five in number, one extending almoſt the length of the back, of a bay or cinnamon colour;

there are two behind the gills, blended with black, green, and purpliſh colours; with the upper edge verged with blue; under the anus extends another long narrow green fin, with a liſt of red through the middle of it; at the baſis of the tail on each ſide is a large narrow ſpot. The tail is large, forked, and green, with a curved red line running through the middle, parallel to the curve, and ending in two points.

This fiſh is more eſteemed for beauty than the delicacy of its taſte. They are taken on the coaſts of Hiſpaniola, Cuba, and the Bahama iſlands.

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## THE EXOCETUS VOLITANS, OR, FLYING-FISH,

IS generally about nine inches long, and full four round at the thickeſt part. The ſkin is uncommonly firm, and the ſcales large and thick. The eye, in conſequence of the largeneſs of the head, is admirably ſituated for diſcovering danger, or prey; and when puſhed out of the ſocket, which the fiſh can do conſiderably, its ſphere of viſion is greatly increaſed.

The wing is no other than a large pectoral fin, compoſed of ſeven or eight ribs or pinions, connected by thin membraneous webs, from the root to the very ſummit. The fore part of the body is fortified juſt behind the gills by a flat bone on each ſide, anſwering all the purpoſes of clavicles and ſcapulæ in land animals; and on the poſterior part of it, the articulation is made with the wing.

In flying, not only their wings and fins are much expanded, but alſo their tail; they ſkim along the ſurface of the deep with great velocity, ſomewhat in the manner of a ſwallow, but in ſtraight lines; and from the blackneſs of their backs, the whiteneſs of their bellies, and forked expanded tails, they have much the ſame appearance. They fly fifty or ſixty yards at one ſtretch; and repeat the exertion again and again by a momentary touch of the ſurface, which gives them new vigour for a new departure.

They generally riſe in ſhoals; and are found in great quantities between lat. 15 deg. and 10 deg. N. and from 20 to 30 W. as alſo between the tropics in the Atlantic, and in the Indian ocean; and the power of exerting itſelf in both elements, is ſaid to furniſh one of the moſt entertaining ſpectacles thoſe ſeas can exhibit. The efforts to ſeize on the one ſide, and the arts of eſcaping on the other, are perfectly amuſing. The ſhark, the porpoiſe, the dolphin, and the dorado, are ſeen upon this occaſion, darting after their prey, which will not leave the water, while it has the advantage of ſwimming, in the beginning of the chace. But, like an hunted hare, being tired at laſt, it then has recourſe to another expedient for ſafety, by flight. The long fins, which began to grow uſeleſs in the water, are now exerted in a different manner, and different direction to that in which they were employed in ſwimming: by this means the timid little animal riſes from the water, and flutters over its ſurface, for ſixty or ſeventy yards till the muſcles, employed in moving the wings, are enfeebled by that particular manner of exertion, and the fiſh is obliged to immerge into its own element. In a ſhort time, however, they have acquired a freſh power of renewing their efforts in the water, and the animal is capable of proceeding with ſome velocity by ſwimming. But ſtill the active enemy keeps it in view, and drives it again from the deep; till, at length, the poor little creature is ſeen to dart to ſhorter diſtances, to flutter with greater effort, and to drop down at laſt into the mouth of its fierce purſuer. But not the aquatic race alone, all animated nature ſeems combined againſt this little fiſh, which ſeems to be poſſeſſed of double powers, only to be ſubject to greater dangers. For though it ſhould eſcape from its enemies of the deep, yet the tropic bird and the albatroſs, the boody and the man of war, are for ever upon the wing to ſeize it. Thus purſued in either element, it ſometimes ſeeks refuge from a new enemy; and it is not unfrequent for whole ſhoals of them to fall on ſhip board, where they furniſh man with an object of uſeful curioſity. But it is ſuſpected from this laſt circumſtance, that their viſion in air is not very diſtinct, as they ſtrike againſt whatever happens to be in their way.

The taſte of this fiſh ſomewhat reſembles mackerel:—they are deſcribed by the ancients, as Johnſon obſerves, under the name of *hirundo*.

The *ſlender flying-fiſh* agrees with the former in having the ſides of the belly ridged, but from which it may be diſcovered at firſt ſight by the ſlenderneſs of the body, and the great length of the ventral fins. This ſpecies has been generally confounded with the former, or overlooked. Probably the ventral fins may aſſiſt its flight. It is not known what ocean or ſea it inhabits.

The *great flying-fiſh* agrees with the ſlender one in the great length of its ventral fins, but differs in having a thick body. This fiſh is near two feet long; the common flying-fiſh not more than eight, nor the ſlender ſort more than ſix inches.

Flying-fiſh are met with in vaſt ſhoals between the tropics, but are not confined to them; having been ſeen, though rarely, and few in number, as low as the latitude of 40 deg. on the coaſt of North America, and 53 deg. of Europe.

The *trigla volitans*, or *kite-fiſh*, as deſcribed by Walcott is here ſubjoined, from its apparent, or tranſitory reſemblance to thoſe already mentioned.

The head is ſquare; two ſtrong ſpines at the hinder part gill cover ending in a long ſtrong ſpine; body roundiſh and ſlender; on the ſcales run lengthwiſe, a ſcalloped thin ridge; between the dorſal fins a ſingle ſhort ſpine; ventral fins very large, reaching to the tail ; four appendages under the throat, united by a web ; tail forked ; length one foot and a half. When freſh taken, the back is either a light or duſty red ; the belly white ; and the ventral fins prettily ſpotted.

The *kite-fiſh* inhabits the Atlantic and Indian oceans, and the Mediterranean ſea ; when purſued by the dorado, &c. quits the water, and by means of its ventral fins flies in the air about a ſtone's caſt.

It is common in the fiſh markets of Italy, Sicily, and Malta.

## THE ECHENEIS, OR SUCKING-FISH.

THE accounts which the ancients have tranſmitted to us of this fiſh are much too marvellous to deſerve notice, nor is the conſiſtency of modern writers on the peculiarity of this animal, more to be relied on. The beſt deſcription is that of Cateſby, which, with ſome additions by Walcott, we ſhall chiefly follow.

The *Echeneis Remora* is uſually about a foot, (Walcott ſays two feet) in length, the head large, equal in bigneſs to the body, which grows ſmaller gradually to the tail, which is ſmall. It has ſix fins, two growing from behind the gills, two more under the throat, a long one on the back, and oppoſite to it under the belly, another of the ſame form and ſize ; the tail forked.

What this fiſh has peculiar to itſelf is, that the crown of the head is flat, and of an oval form, with a ridge, or riſing, running lengthways, and croſſways to this, ſixteen ridges, with hollow furrows between, by which ſtructure it can fix itſelf to any animal or other ſubſtance, as they are often found adhering to the ſides of ſhips, and the bodies of ſharks and other large fiſh. But the notion that this ſmall fiſh was able to ſtop a ſhip under ſail, or a whale in ſwimming, is entirely fabulous; all they can do is no more than what ſhells, or corals, and other foulneſſes, which make her ſail ſomewhat the ſlower. Cateſby adds, that he has taken five of them from off the body of a ſhark, which were fixed on ſo faſt to different parts of his body, that it required great ſtrength to ſeparate them. "I have alſo ſeen them, ſays he, diſengaged and ſwimming very deliberately near the ſhark's mouth, without his attempting to ſwallow them, the reaſon of which I am not able to give."

The ſucking-fiſh is eſteemed tolerable good eating; though what Oppian and Pliny relate of its powers in ſtopping a galley with four hundred rowers, and a ſhip in full ſail, merit no credit; yet like the marvellous accounts of ſome other creatures, appear to be not wholly without foundation. Abbé Fortis ſays, that once ſailing in the Gulph of Venice in a ſmall bark, the man at the helm ſuddenly called to his companion to kill a remora, which had fixed itſelf to the rudder, and which did then, as he had often experienced before, ſenſibly both retard, and alter the courſe of the veſſel. Thus what might have happened to a boat, is by Oppian and Pliny transferred to a galley, or ſhip.

## THE EEL—MURENA.

THIS is one of the ſoft-finned apodal fiſh; properly characteriſed under that head, and ſo generally known as to preclude further deſcription.

The eel is poſſeſſed of a power of climbing over any obſtacle; for by applying their glutinous and ſlimy bodies to the ſurface of the object they deſire to ſurmount, they can thus creep up locks, weirs, and every thing that would prevent their aſcending the current of the ſtream.

We have noticed ſeveral fiſh that mount up rivers to depoſit their ſpawn ; there are others that deſcend the freſh water ſtream to bring forth their young in the ſea :---Rhedi places the eel in this number.

About the month of Auguſt annually theſe creatures take the opportunity of the moſt obſcure nights, and when the rivers are flooded by accidental rains to ſeek the ocean. When they have reached the ſea, and produced their young, for they are viviporous, they again aſcend the ſtream, at different times, as opportunity offers, or as the ſeaſon is favorable. Their paſſage uſually begins about the end of January, and continues till towards the end of May, when they are taken in the river Arno, by millions, and ſo ſmall, that an almoſt incredible number of them goes to a pound weight. In England it is certain that they deſcend the rivers after floods in great abundance, and are thus caught in nets in great numbers.

*Ammodytes*, or *ſand-eel,* belongs to the above genus. This fiſh reſembles an eel, and ſeldom exceeds a foot in length. The head of the ammodytes is compreſſed, and narrower than the body ; the upper jaw is narrower than the under, the body is cylindrical with ſcales, hardly perceptible There is but one ſpecies of the ammodytes, viz. the tobianus, or launce, a native of Europe. This fiſh gathers itſelf into a circle, and pierces the ſand with its head in the centre. It is found in moſt of our ſandy ſhores during ſome of the ſummer months; it conceals itſelf, on the receſs of the tides, beneath the ſand, in ſuch places where the water is left, at the depth of about a foot; and is in ſome places dug out, in others drawn up by means of a hook contrived for that purpoſe. They are commonly uſed as baits for other fiſh, but they are alſo very delicate eating. Theſe fiſh are found in the ſtomach of the porpeſſe; an argument that the laſt roots up the ſand with its noſe, as hogs do the ground.

## THE PIKE

WAS little known among the ancients, although it is a freſh-water fiſh ſo common in every part of Europe. He is of an oblong figure, with a large mouth, well furniſhed with teeth, and is likewiſe extremely voracious. He feeds on other fiſh, inſects, water-rats, frogs and aquatic birds, when he can catch them. He is likewiſe fond of eating the eggs of other fiſh, and will devour every thing in a fiſh-pond, if he is ſuffered to remain there for any length of time. But as the pike is reckoned a good diſh, his days are greatly abridged; yet, in the opinion of many naturaliſts, the longeſt lived of all fiſh. The larger the pike, the coarſer the food, and vice verſa. The fiſh is peculiarly prolific, for we have counted in the body of a female pike about one hundred and fifty thouſand eggs. Theſe pikes frequently ſwallow other fiſh, as large as themſelves; they ſeize them always by the head, and digeſt one part of their prey, before they can ſwallow or draw into their mouths the other. And what is particular in natural hiſtory, the pike having ravaged a pond, will attack and devour one another. This fiſh is likewiſe remarkable for its longevity; for in the year 1523 was caught in Suabia, a very large pike, who appeared very old, and, on examining it, they found a braſs ring in one of his noſtrils, on which was read a Latin inſcription, the purport of which was, *The Emperor, Frederic II. has thrown me into his pond with his own hands, the 5th of October,* 1262. From hence they concluded, that this pike had inhabited that pond for above 260 years. The eggs of this fiſh are highly unwholeſome and even dangerous, but their fat, liver, gall, and jaw-bones pulveriſed, are uſeful in phyſic.

The pike has been poetically ſtyled the tyrant of the watery plain; and, in fact, in proportion to his ſtrength and celerity, he is the moſt active and voracious of the freſh water fiſh. He will attack every fiſh leſs than himſelf, and is ſometimes ſeen choaked by attempting to ſwallow ſuch as are too large a morſel. It is immaterial of what ſpecies the animal it purſues appears to be, whether of another or its own; all are indiſcriminately devoured; ſo that every fiſh owes its ſafety to its minuteneſs, its celerity, or its courage: nor does the pike confine itſelf to feed on fiſh and frogs; it will draw down the water-rats and the young ducks as they are ſwimming about.

Geſner relates a ſtory of a mule that ſtooped to drink in the water, when a famiſhed pike that was near ſeized it by the noſe, nor was it diſengaged till the beaſt flung it on ſhore.

So great is the rapacity of the pike, that he will contend with the otter for his prey, and even endeavour to force it from him. For this reaſon it is dreaded by all other fiſh ; and the ſmall ones ſhew the ſame uneaſineſs and deteſtation at the preſence of their tyrant, as the little birds do at the ſight of an hawk or an owl. When the pike lies aſleep near the ſurface, as is frequently the caſe, the leſſer fiſh are often obſerved to ſwim round it in vaſt numbers, with a mixture of caution and terror.

## THE MACKEREL—SCOMBER.

THIS is a ſalt-water fiſh without ſcales; its body is round and fleſhy, terminating almoſt in a point at each extreme. It is ordinarily about a foot long; when in the water it appears yellow, and when out of it, a ſilver white, excepting ſome ſtreaks or ſpeckles of a deep blue on the back and ſides.

Naturaliſts have obſerved, that the water wherein mackerel has been boiled, yields a light, after ſtirring it a little.

Some perſons, ſkilled in naval architecture, aſſert that the figure of the mackerel is the moſt commodious for ſwimming of all others, and have therefore propoſed it as a model for the building of ſhips.

The mackerel is found in large ſhoals in divers parts of the ocean, but eſpecially on the Engliſh and French coaſts, during the months of April, May, and June.

Some varieties of this fiſh are found among the Carribee iſlands.

## THE GURNET—TRIGLA

IS a ſalt-water fiſh, about the ſize of a middling whiting; its tail, fins, and gills, and a great part of its body, are of a reddiſh caſt; the head remarkably large in proportion to the body, which is round and very taper; and its fins of an unuſual length, probably to remedy the inconvenience which, on account of the largeneſs of its head, it muſt otherwiſe labour under, in making its way through the water. In the weſtern parts of the Britiſh coaſt, where it is moſt frequently caught, the meaner ſort of people parboil, and afterwards ſteep it in pickle, calling it *ſous'd gurnet*; a term that may ſerve to explain an expreſſion ſomewhat conteſted in Shakeſpeare's Second Part of Henry IV. where Falſtaff ſays ---"If I be not aſhamed of my ſoldiers, *I am a ſous'd gurnet.*"

## THE GREYLING, OR UMBER.

THE technical name of this fiſh is *Thymallus*. It is of a long flatted body, the back is ſomewhat broad, and the belly rigid and thin. The back has two fins, and the tail is forked; the head is ſmall, the eyes large and protuberant; the mouth is moderately large, and the upper jaw larger than the under; has no teeth but the whole jaws are rough like a file.

Its back is of a duſky browniſh green, with a ſomewhat bluiſh caſt intermixed, and its ſides of a more ſhining gloſs, with an admixture of gold colour. The ſcales are almoſt of a rhomboidal figure, and the ſide lines are much nearer the back than the belly; the ſides are variegated with black ſpots placed irregularly, but there are none of theſe near the tail. The greyling ſeldom exceeds a pound, or at the utmoſt a pound and a half in weight.

This fiſh is caught in the freſh rivers in the mountainous counties in England, and in the like ſituations in Germany and other kingdoms; and is one of the fineſt taſted of all the freſh-water fiſh.—It feeds on worms, and ſpawns in May.

## THE LOACH.

THE *Cobitis*, Loach, is a genus of fiſh of which there are five ſpecies. The eyes are in the upper part of the head; the gill-covering membrane has from four to five rays, and the body is nearly of an equal thickneſs throughout. The loach is found in ſeveral of our ſmall rivers, keeping at the bottom on the gravel; and on that account is in ſome places called the *groundling*. It is frequent in the ſtream near Amerſbury in Wiltſhire, where the ſportſmen, through frolic, ſwallow it down alive in a glaſs of white wine.

## THE SMELT—ATHEURIA.

THIS is a ſoft-finned abdominal fiſh; the characters of which have been given: it includes two ſpecies.

1. The *hepſetus*, with about twelve rays in the fin next the anus. It is found in the Mediterranean; it is very plentiful in the ſea near Southampton, as well as on other coaſts of our iſland. The length is about five inches, and the tail is much forked. It is a beautiful little fiſh, ſemi-pellucid, covered with ſcales; the colour ſilvery, tinged with yellow; beneath the ſide line is a row of ſmall black ſpots. The higheſt ſeaſon for this fiſh is from March to the latter end of May or beginning of June, in which month it ſpawns. It never deſerts its accuſtomed places, and may be conſtantly taken except in hard froſt.

2. The *menidea*, with twenty-four rays in the fin next the anus. This is a very ſmall

pellucid fiſh with many black points interſperſed; it has many teeth in the lips, but none in the tongue or jaws. It is found in the freſh waters of Carolina, and ſpawns in April.

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OF above five hundred ſpecies of fiſh which the ſpinous claſs includes, we have attempted to pourtray the leading features of thoſe which uſually come under obſervation, and whatever could be collected of their general hiſtory has been faithfully detailed:—we muſt diſmiſs the ſubject therefore with a ſlight mention of a few which appear not intereſting enough to deſerve a particular deſcription.

The *Perch* is hook-backed, not unlike a hog, armed with ſtiff griſtles, and his ſides with dry thick ſcales: he is voracious, and will venture on his own kind even with greater courage than the pike. It is diſtinguiſhed by ſeveral tranſverſe ſtreaks, and by having the belly-fins red: it is from nine inches to a foot in length, and conſiderably thick in proportion. There are two ſpecies found among the Carribee iſlands and on the coaſts of North America;

rica; one has the body ſtriped lengthways with a light purpliſh red on a yellowiſh ground; the body of the other is ſtriped tranſverſely with yellow.

The *Mullet*, characterized among the prickly finned thoracii fiſh, No. 18; is common in the Mediterranean; a kind of ſauſage, called *botargo*, is made of the eggs and blood. The beſt kind comes from Tunis, in Barbary; it muſt be choſen dry and reddiſh. The people of Provence uſe a great deal of it, the common way of eating it being with olive oil and lemon juice. There is alſo a great conſumption of it through the Levant.

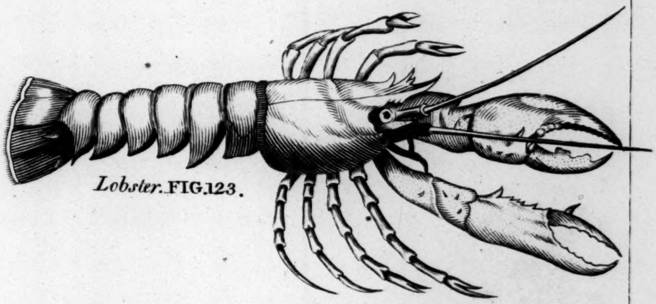
The *Blenny* affords thirteen ſpecies, of which two deſerve mention: the *viviparous*, which brings forth two or three hundred young ones at a time. Their ſeaſon for parturition is a little after the depth of winter. Before Midſummer they quit the bays and ſhores, and retire into the deep where they are commonly taken. They are a very coarſe fiſh, and eaten only by the very poor. They are common in the mouth of the river Eſke, at Whitby, Yorkſhire, where they are frequently taken from off the bridge, ſometimes a foot in length.

The *Raninus*, with ſix diviſions in the belly-fins, is found in the lakes of Sweden; and it is remarkable that when this fiſh appears in the lake, all the other fiſh retire; and what is worſe, this is not fit for eating.

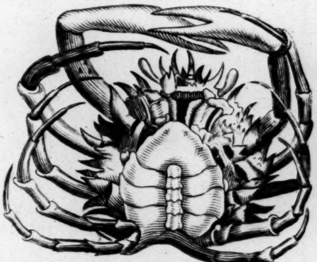
## THE CRAB, THE LOBSTER, AND THEIR AFFINITIES.

THE language of philoſophy, and that of mankind in general, is very different reſpecting the claſs of animals now coming under conſideration: they are uſually denominated *fiſh*, but many naturaliſts have placed them among the inſect tribe; whiſe Goldſmith has placed them along with the turtle; though for what other reaſon than their cruſtaceous covering, it is not eaſy to diſcover.

From the firſt view of a lobſter, it is obvious that its cruſtaceous covering bears a ſtrong analogy to the bones of other animals; and that by theſe ſhells the animal is ſuſtained and defended;

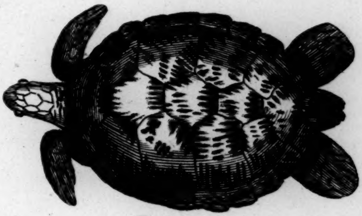


*Lobster.* FIG.123.



*Crab.*124.

D°.125



*Turtle.*126.

The *Gammarus*, or common lobſter, with a ſmooth thorax, ſhort ſerrated ſnout, very long antennæ, and between them two ſhorter ones, bifid claws and fangs large, the greater tuberculated, the leſſer ſerrated on the inner edge; four pair of legs, ſix joints in the tail, tail-fins rounded. It inhabits all the rocky ſhores of our iſland, but chiefly where there is a depth of water. In Llyn, in Caernarvonſhire, a certain ſmall lobſter, nothing different except in ſize, burrows in the ſand. They are brought in vaſt quantities from the Orkney iſles, and many parts of the Eaſtern coaſt of Scotland, to the London markets. Sixty or ſeventy thouſand are annually brought from the neighbourhood of Montroſe alone. The lobſter was well known to the ancients, is accurately deſcribed by Ariſtotle, and is found as far as the Helleſpont.

Lobſters fear thunder, and are apt to caſt their claws on a great clap; it is ſaid that they will do the ſame on the firing of a great gun, and that when men of war meet a lobſter boat, a jocular threat is uſed, that, if the maſter does not ſell them good lobſters, they will ſalute him. The habitation of this ſpecies is in the cleareſt water, at the foot of rocks that impend over the ſea. This has given opportunity of examining more cloſely into the natural hiſtory of this animal, than of many others who live in an element that prohibits moſt of the human reſearches, and limits the inquiries of the moſt inquiſitive. Some lobſters are taken by hand; but the greater quantity in pots, a ſort of trap formed of twigs, and baited with garbage; they are formed like a wire mouſe-trap, ſo that when the lobſters get in there is no returning. Theſe are faſtened to a cork ſunk in the ſea, and their place marked by a buoy. They begin to breed in the ſpring, and continue breeding moſt part of the ſummer. They propagate *more humano*, and are extremely prolific. Dr. Baſter ſays he counted 12,444 eggs under the tail, beſides thoſe that remained in the body unprotruded. They depoſit their eggs in the ſand, where they are ſoon hatched. Lobſters change their cruſt annually. Previous to their putting off their old one, they appear ſick, languid, and reſtleſs. They totally acquire a new coat in a few days; but during the time that they remain defenceleſs, they ſeek ſome lonely place for fear of being devoured by ſuch of their brethren as are not in the ſame ſituation. It is alſo remarkable that lobſters and crabs will renew their claws if, by accident, they are torn off; and it is certain they will grow again in a few weeks, though they never attain to the ſize of the firſt. They are voracious animals, and feed on ſea-weeds, garbage, and all ſorts of dead bodies. The pincers of one of the lobſter's large claws are furniſhed with knobs, and thoſe of the other are always ſerrated. With the former it keeps firm hold of the ſtalks of ſubmarine plants, and with the latter it cuts and minces its food very dexterouſly. The knobbed, or *numb* claw, as the fiſhermen call it, is ſometimes on the right, and ſometimes on the left ſide indifferently. It is more dangerous to be ſeized by them with the cutting claw than the other; but, in either caſe, the quickeſt way to get diſengaged from the creature is to pull off its claw. The female, or *hen*-lobſter does not caſt her ſhell the ſame year that ſhe depoſits her *ova*, or, in the common phraſe, is in *berry*. When the ova firſt appear under her tail, they are ſmall, and extremely black; but they come in ſucceſſion almoſt as large as ripe elder-berries before they are depoſited, and turn of a dark brown colour, eſpecially towards the end of the time of her depoſiting them. They continue full, and depoſiting the ova in conſtant ſucceſſion, as long as any of that black ſubſtance can be found in their body, which, when boiled, turns of a beautiful red colour, and is called their *coral.* Hen-lobſters are found in berry at all times of the year, but chiefly in winter. It is a common miſtake, that a berried hen is always in perfection for the table. When her berries appear large and browniſh, ſhe will always be found exhauſted, watery, and poor. Though the ova be caſt at all times of the year, they ſeem only to come to life during the warm ſummer months of July and Auguſt. Great numbers of them may then be found, under the appearance of tad-poles, ſwimming about the little pools, left by the tides among the rocks, and many alſo under their proper form from half an inch to four inches in length. In caſting their ſhells, it is hard to conceive how the lobſter is able to draw the fiſh of their large claws out, leaving the ſhells entire, and attached to the ſhell of their body, in which ſtate they are conſtantly found. The fiſhermen ſay the lobſter pines before caſting, till the fiſh of its large claw is no thicker than the quill of a gooſe, which enables it to draw its parts through the joints and narrow paſſage near the trunk. The new ſhell is quite membraneous at firſt, but

hardens

hardens by degrees. Lobſters only grow in ſize while their ſhells are in their ſoft ſtate. They are choſen for the table, by their being heavy in proportion to their ſize ; and by the hardneſs of their ſhells on their ſides, which, when in perfection, will not yield to moderate preſſure. Barnacles, and other ſmall fiſh adhering to them, are reckoned certain ſigns of ſuperior goodneſs. Cock-lobſters are in general better than the hens in winter; they are diſtinguiſhed by the narrowneſs of their nails, and by their having a ſtrong ſpine upon the centre of each of the tranſverſe proceſſes beneath the tail, which ſupport the four middle plates of their tails. The fiſh of a lobſter's claw is more tender, delicate, and eaſy of digeſtion, than that of the tail. In ſummer, the lobſters are found near the ſhore, and thence to about ſix fathom water ; in winter they are ſeldom taken in leſs than 12 or 15 fathoms. Like moſt inſects, they are much more active and alert in warm weather than in cold. In the water they can ruſh nimbly upon their legs or ſmall claws ; and, if alarmed, can ſpring, tail foremoſt, to a ſurpriſing diſtance, as ſwift as a bird can fly. The fiſhermen can ſee them paſs about 30 feet ; and, by the ſwiftneſs of their motion, ſuppoſe they may go much further. Athenæus remarks this circumſtance; and ſays, that “ the incurvated lobſters will ſpring with the activity of dolphins.” Their eyes are raiſed upon moveable baſes, which enable them to ſee readily every way. When frightened, they will ſpring from a conſiderable diſtance to their hole in the rock; and, what is not leſs ſurpriſing than true, will throw themſelves into their hole in that manner through an entrance barely ſufficient for their bodies to paſs.

2. The ſtrigoſus, or plated lobſter, with a pyramidal ſpiny ſnout; thorac elegantly plated, each plate marked near its junction with ſhort ſtriæ; claws much longer than the body, thick, echinated, and tuberculated; the upper fang trified; only three legs ſpiny on their ſides; tail broad. The largeſt of this ſpecies is about ſix inches long. It inhabits the coaſts of Angleſea, under ſtones and fuci. It is very active; and, if taken, flaps its tail againſt the body with much violence and noiſe.

3. The aſtacus, or craw-fiſh, with a projecting ſnout, ſlightly ſerrated on the ſides; a ſmooth thorax; back ſmooth, with two ſmall ſpines on each ſide; claws large, beſet with ſmall tubercles; two firſt pair of legs clawed;

the two next ſubulated ; tail conſiſting of five joints ; the caudal fins rounded. It inhabits many of the rivers in England, lodges in holes which they form in the clay banks. Cardian ſays, that this ſpecies indicates the goodneſs of water ; for in the beſt water they are boiled into the reddeſt colour.

The fleſh of the cray-fiſh is cooling, moiſtening, and adapted to nouriſh ſuch as labour under conſumptions. Though they are variouſly dreſſed, yet no parts of them are eatable except their claws and tails. Soups are frequently made of them, which are rendered ſtill more medicinal by the addition of herbs, ſnails, or other ſubſtances, according to the intention of the phyſician. The fleſh is accounted beſt in the ſummer months.

The delicate flavour of theſe fiſh depends in a great meaſure on their food. When they have well taſted food, their fleſh preſerves the reliſh of it ; but when they feed on other things, they are often rendered of no value by the flavour communicated to their fleſh by them.

There are great quantities of theſe fiſh in the river Obra, on the borders of Sileſia ; but the people find them ſcarcely eatable, becauſe of a bitter aromatic flavour, very diſagreeable in food.

It has lately been obſerved, that the *calamus aromaticus* grows in vaſt abundance on the banks of that river, and that theſe creatures feed very greedily upon its roots. Theſe have a very remarkable bitterneſs mixed with their aromatic flavour, while freſh, which goes off very much in the drying; and on comparing the taſte of theſe roots with that of the cray-fiſh, there remains no doubt of the one being owing to the other.

They abound in the river Don, in Muſcovy, where they are laid in heaps to putrify; after which the ſtones called *crabs-eyes* are picked out. Theſe animals are very greedy of fleſh, and flock in great numbers about carcaſes thrown into the water where they are, and never leave them while any remains. They alſo feed on dead frogs when they come in their way. In Switzerland there are ſome cray-fiſh which are red when they are alive, and others bluiſh. Some kinds of them alſo will never become red even by boiling, but continue blackiſh.

The cray-fiſh diſcharges itſelf of its ſtomach; and, as Geoffrey thinks, of its inteſtines too. Theſe, as they putrify and diſſolve, ſerve for food to the animal; during the time of the reformation, the old ſtomach ſeems to be the firſt food that the new one digeſts. It is only at this time that the ſtones are found called *crabs-eyes* ; they begin to be formed when the old ſtomach is deſtroyed, and are afterwards wrapped up in the new one, where they decreaſe by degrees till they entirely diſappear.

4. The ſerratus, a prawn, with a long ſerrated ſnout, bending upwards ; three pair of very long filiform feelers ; claws ſmall, furniſhed with two fangs ; ſmooth thorax ; five joints to the tail, middle caudal fin ſubulated, two outmoſt flat and rounded. It is frequent in ſeveral ſhores among looſe ſtones ; ſometimes found at ſea, and taken on the ſurface over thirty fathoms depth of water ; cinereous when freſh, of a fine red when boiled.

5. The crangon, or ſhrimp, with long ſlender feelers, and between them two projective laminæ ; claws with a ſingle hooked moveable fang, three pair of legs ; ſeven joints in the tail ; the middle caudal fin ſubulated, the four others round and fringed, a ſpine on the exterior ſide of each of the outmoſt. It inhabits the ſhores of Britain in vaſt quantities, and is the moſt delicious of the genus.

6. The ſquilla, with a ſnout like a prawn, but deeper and thinner ; the feelers longer in

proportion to the bulk; the ſub-caudal fins rather larger; is, at full growth, not above half the bulk of the former. It inhabits the coaſt of Kent; and is ſold in London under the name of the *white ſhrimp*, as it aſſumes that colour when boiled.

7. The atamos, or atam-lobſter, with a ſlender body; filiform antennæ; three pair of legs near the head; behind which are two pair of oval veſiculæ; beyond are three pair of legs, and a ſlender tail between the laſt pair. It is very minute, and the help of the microſcope is often neceſſary for its inſpection.

8. The puler, or flea-lobſter, with five pair of legs, and two claws imperfect, with twelve joints of the body. It is very common in fountains and rivulets; ſwims very ſwiftly in an incurvated poſture on its back; embraces and protects its young between the legs; does not leap.

9. The locuſt, or locuſt-lobſter, with four antennæ; two pair of imperfect claws; the firſt joint ovated; body conſiſts of fourteen joints, in which it differs from the former. It abounds, in ſummer, on the ſhores beneath ſtones and algæ; leaps about with vaſt agility.

10. The diogenes, ſoldier-crab, or hermit-crab, with rough claws; the left claw is the longeſt, (this being the only difference between the *diogenes* and *bernpadus*) the legs are ſubulated, and ſerrated along the upper ridge; the tail naked and ſlender, and furniſhed with a hook, by which it ſecures itſelf in its lodging. This ſpecies is paraſitic, and inhabits the empty cavities of turbunated ſhells, changing its habitation according to its increaſe of growth, from the ſmall *nerite* to the large *whelk*. Nature denies it the ſtrong covering behind, which it hath given to others of this claſs; and therefore directs it to take refuge in the deſerted caſes of other animals. They crawl very faſt with the ſhell on their back; and at the approach of danger draw themſelves within the ſhell, and, thruſting out the larger claw, will pinch very hard whatever moleſts them. By the moderns it is called the *ſoldier*, from the idea of its dwelling in a tent; or the *hermit*, from retiring into a cell.

It is very diverting to obſerve this animal when wanting to change its ſhell. The little ſoldier is ſeen buſily parading the ſhore along that line of pebbles and ſhells which is formed by the extremeſt wave, ſtill, however, dragging its old incommodious habitation at its tail, unwilling to part with one ſhell, even though a troubleſome appendage, till it can find another more convenient. It is ſeen ſtopping at one ſhell, turning it, and paſſing it by; going on to another, contemplating that for a while, and then ſlipping its tail from its old habitation to try on the new; this alſo is found to be inconvenient, and it quickly returns to its old ſhell again. In this manner it frequently changes, till at laſt it finds one light, roomy, and commodious; to this it adheres, though the ſhell be ſometimes ſo large as to hide the body of the animal, claws and all. Yet it is not till after many trials, and many combats alſo, that the ſoldier is thus completely equipped; for there is often a conteſt between two of them for ſome well-looking favourite ſhell for which they are rivals. They both endeavour to take poſſeſſion, they ſtrike with their claws, they bite each other, till the weakeſt is obliged to yield by giving up the object of diſpute. It is then that the victor immediately takes poſſeſſion, and parades it in his new conqueſt three or four times back and forward upon the ſtrand before his envious antagoniſt. When this animal is taken it ſends forth a feeble cry, endeavouring to ſeize the enemy with its nippers; which, if it faſtens upon, it will ſooner die than quit the graſp.

The hermit crabs frequent moſtly thoſe parts of the ſea-ſhore which are covered with ſhrubs and trees, producing various wild fruits on which they ſubſiſt; though they will alſo feed on the fragments of fiſh and other animal ſubſtances caſt on ſhore. When roaſted in the ſhell, they are eſteemed delicate. The hermit-crab, hung in the air, diſſolves into a kind of oil, which gives ſpeedy relief to rheumatic pains, if rubbed upon the part.

11. The vocans, or ſand-crab, is but of a ſmall ſize; its colour light brown, or duſky white. It has eight legs, and two claws, one of which is double the ſize of the other: theſe claws ſerve both to defend and feed themſelves with. The head has two ſquare holes, which are receptacles for its eyes, out of which it thruſts them and draws them in again at pleaſure. Their abode is only on the ſandy ſhores of Flathera, and many other of the Bahama iſlands. They run very faſt, and retreat from danger into little holes they make in the ſand.

12. The grapſus, or red-mottled-crab, hath a round body, the legs longer and larger than in other kinds; the claws red, except which,

the whole is mottled in a beautiful manner with red and white. Theſe crabs inhabit the rocks hanging over the ſea; they are the nimbleſt of all others, and run with ſurpriſing agility along the upright ſide of a rock, and even under the rocks that hang horizontally below the water. This they are often neceſſitated to do for eſcaping the aſſaults of rapacious birds that purſue them. Theſe crabs never go to land; but frequent moſtly thoſe parts of the promontories and iſlands of rocks in and near the ſea, where by the continual and violent agitation of the waves againſt the rocks, they are always wet, continually receiving the ſpray of the ſea, which often waſhes them into it; but they inſtantly return to the rock again, not being able to live under water, and yet requiring more of that element than any of the cruſtaceous kinds that are not fiſh.

13. The granulatus, or rough-ſhelled crab: theſe crabs are pretty large, and are commonly taken from the bottom of the ſea in ſhallow water; the legs are ſmall in proportion to the body; the two claws are remarkably large and flat. The whole ſhell is covered over with innumerable little tubercles like ſhagreen: the colour is brown, variouſly ſtained with purple.

14. The cancer erythropus, or red-claw crab, is of a ſmall ſize, and brown colour; it hath two claws of unequal bigneſs, red at the ends, and eight legs, which ſeem of leſs uſe to them than in other crabs; for when on the ground, they crawl with a ſlow pace, dragging their bodies along; but they are moſtly ſeen graſping with their claws, and hanging to ſome ſea-plant, or other marine ſubſtance.

15. The piſum, or pea-crab, with rounded and ſmooth thorax, entire and blunt; with a tail of the ſize of the body, which commonly is the bulk of a pea. It inhabits the muſcle, and has unjuſtly acquired the repute of being poiſonous. The ſwelling after eating of muſcles is wholly conſtitutional; for one that is affected by it, hundreds remain uninjured. Crabs either of this kind, or allied to them, the ancients believed to have been the conſentaneous inmates of the PINNA, and other bivales; which, being too ſtupid to perceive the approach of their prey, were warned of it by their vigilant friend.

16. The manus, or common crab, with three notches on the front; five ſerrated teeth on each ſide; claws elevated; next joint toothed; hind feet ſubulated; dirty green colour;

lour; red when boiled. It inhabits all our ſhores; and lurks under the algæ, or burrows under the ſand. It is ſold, and eaten by the poor of our capitals.

17. The pagurus, or black-clawed crab, with a crenated thorax; ſmooth body; hind feet ſubulated. It inhabits the rocky coaſts; is the moſt delicious meat of any, caſts its ſhell between Chriſtmas and Eaſter. The tips of the claws of this ſpecies are uſed in medicine, intended to abſorb acidities in the ſtomach and bowels.

18. The velutinus, or velvet crab, with the thorax quinquedentated; body covered with ſhort, brown, velvet-like pile, claws covered with minute tubercles; ſmall ſpines round the top of the ſecond joint; hind legs broadly ovated. This is among the ſpecies taken notice of by Ariſtotle on account of the broad feet, which, he ſays, aſſiſt them in ſwimming, as web feet do the water-fowl. It inhabits the weſtern coaſt of Angleſea.

19. The *horridus*, or horrid crab, with a projecting bifurcated ſnout, the end diverging; body heart-ſhaped, with the claws and legs covered with long and very ſharp ſpines. It is a

large ſpecies, and inhabits the rocks on the eaſtern coaſts of Scotland.

20. The *ruricola*, land-crab, or violet-crab, with a ſmooth entire thorax, and the two laſt joints of the feet armed with ſpines. It inhabits the Bahama iſlands, as well as moſt lands between the tropics; and feeds upon vegetables.

Theſe animals live not only in a kind of orderly ſociety in their retreats in the mountains, but regularly once a year march down to the ſea-ſide in a body of ſome millions at a time. As they multiply in great numbers, they chooſe the month of April or May to begin their expedition; and then ſally out by thouſands from the ſtumps of hollow trees, from the clefts of rocks, and from the holes which they dig for themſelves under the ſurface of the earth. At that time the whole ground is covered with this band of adventurers; there is no ſetting down one's foot without treading on them. The ſea is their place of deſtination, and to that they direct their march with right-lined preciſion. No geometrician could ſend them to their deſtined ſtation by a ſhorter courſe; they neither turn to the right nor left, whatever obſtacles intervene; and even if they meet with a houſe, they will attempt to ſcale the walls to keep the unbroken

broken tenor of their way. But though this be the general order of their route, they, upon other occaſions, are obliged to conform to the face of the country; and, if it is interſected with rivers, they are then ſeen to wind along the courſe of the ſtream. The proceſſion ſets forward from the mountains with the regularity of an army under the guidance of an experienced commander. They are commonly divided into three battalions; of which the firſt conſiſts of the ſtrongeſt and boldeſt males, that, like pioneers, march forward to clear the route, and face the greateſt dangers. Theſe are often obliged to halt for want of rain, and go into the moſt convenient encampment till the weather changes. The main body of the army is compoſed of females, which never leave the mountains till the rain is ſet in for ſome time, and then deſcend in regular battalia, being formed into columns of 50 paces broad, and three miles deep, and ſo cloſe that they almoſt cover the ground. Three or four days after this the rear-guard follows, a ſtraggling undiſciplined tribe, conſiſting of males and females; but neither ſo robuſt nor ſo vigorous as the former. The night is their chief time of proceeding; but if it rains by day, they do not fail to profit by the occaſion; and they continue to move forward in their ſlow uniform manner. When the ſun ſhines and is hot upon the ſurface of the ground, they then make an univerſal halt, and wait till the cool of the evening. When they are terrified, they march back in a ſtrange diſorderly manner, holding up their nippers, with which they ſometimes tear off a piece of the ſkin, and then leave the weapon where they inflicted the wound. They even try to intimidate their enemies; for they often clutter their nippers together, as it were to threaten thoſe that come to diſturb them. But though they thus ſtrive to be formidable to man, they are much more ſo to each other; for they are poſſeſſed of one moſt unſocial property, which is, that if any of them by accident is maimed in ſuch a manner as to be incapable of proceeding, the reſt fall upon and devour it on the ſpot, and then purſue their journey.

When, after a fatiguing march, and eſcaping a thouſand dangers, (for they are ſometimes three months in getting to the ſhore), they have arrived at their deſtined port, they prepare to caſt their ſpawn. The peas are as yet within their bodies, and not excluded, as is uſual in animals of this kind, under the tail; for the creature waits for the benefit of ſea-water, to help the delivery. For this purpoſe the crab has no ſooner reached the ſhore, than it eagerly goes to the edge of the water, and lets the waves waſh over its body two or three times. This ſeems only a preparation for bringing their ſpawn to maturity; for, without further delay, they withdraw to ſeek a lodging on land; in the mean time, the ſpawn grows large, is excluded out of the body, and ſticks to the barbs under the flap, or more properly the tail. This bunch is ſeen as big as an hen's egg, and exactly reſembling the roes of herrings. In this ſtate of pregnancy, they once more ſeek the ſhore for the laſt time; and ſhaking off their ſpawn into the water, leave accident to bring it to maturity. At this time whole ſhoals of hungry fiſh are at the ſhore in expectation of their annual ſupply; the ſea to a great diſtance ſeems black with them; and about two thirds of the crabs' eggs are immediately devoured by theſe rapacious invaders. The eggs that eſcape are hatched under the ſand; and, ſoon after, millions at a time of theſe little crabs are ſeen quitting the ſhore, and ſlowly travelling up to the mountains. The old ones, however, are not ſo active to return; they have become ſo feeble and lean, that they can hardly creep along, and the fleſh at that time changes its colour. The moſt of them, therefore, are obliged to continue in the flat parts of the country, till they recover, making holes in the earth, which they cover at the mouth with leaves and dirt, ſo that no air may enter. There they throw off their old ſhells, which they leave, as it were, quite whole; the place where they opened on the belly being unſeen. At that time they are quite naked, and almoſt without motion for ſix days together, when they become ſo fat as to be delicious food. They have then under their ſtomachs four large white ſtones which gradually decreaſe in proportion as the ſhell hardens; and, when they come to perfection, are not to be found. It is at that time that the animal is ſeen ſlowly making its way back; and all this is moſt commonly performed in the ſpace of ſix weeks.

This animal, when poſſeſſed of its retreats in the mountains, is impregnable: for, only ſubſiſting upon vegetables, it ſeldom ventures out; and its habitation being the moſt inacceſſible places, it remains for a great part of the ſeaſon in perfect ſecurity. It is only when impelled by the deſire of bringing forth its young, and when compelled to deſcend into the flat country, that it is taken. At that time the natives wait for its deſcent in eager expectation, and deſtroy thouſands, but, diſregarding their bodies, they only ſeek for that ſmall ſpawn that lies on each ſide of the ſtomach within the ſhell, of about the thickneſs of a man's thumb. They are much more valuable upon their return after they have caſt their ſhell, for, being covered with a ſkin reſembling ſoft parchment, almoſt every part except the ſtomach may be eaten. They are taken in the holes by feeling for them with an inſtrument; they are ſought after by night, when on their journey, with flambeaux. The inſtant the animal perceives itſelf attacked, it throws itſelf on its back, and with its claws pinches moſt terribly what it happens to faſten on. But the dextrous crab-catcher takes them by the hinder legs in ſuch a manner that the nippers cannot touch him, and thus he throws them into his bag. Sometimes alſo they are caught when they take refuge in the bottoms of holes in rocks by the ſea-ſide, by clapping a ſtick at the mouth of the hole, which prevents their getting out; and then, ſoon after, the tide coming, enters the hole, and the animal is found upon its retiring, drowned in its retreat.

Theſe crabs are of various ſizes, the largeſt about ſix inches wide; they walk ſide-ways like the ſea-crab, and are ſhaped like them; ſome are black, ſome yellow, ſome red, and others variegated with red, white, and yellow mixed. Some of theſe are poiſonous; and ſeveral people have died of eating the crabs, particularly of the black kind. The light coloured are reckoned beſt; and when full in fleſh, are very well taſted. In ſome of the ſugar iſlands they are eat without danger; and no ſmall help to the negroe ſlaves, who, on many of theſe iſlands, would fare very bad without them.

From the foregoing deſcription of many of the various ſpecies of cruſtaceous fiſh, it appears, that however different in figure the lobſter and the crab may ſeem, their manners and conformation are nearly the ſame. Though without any red blood circulating through their veins, or any warmth in their bodies, they poſſeſs all the voracity of the finny tribe; yet they are condemned to lead an inſect life at the bottom of the water; and though preſſed by continual hunger, they are often obliged to wait till accident brings them their prey. But whatever they ſeize upon, that has life, is ſure to periſh, though never ſo well defended; they even devour each other, and in ſome meaſure may be ſaid to feed upon themſelves, as the old ſtomach which they caſt upon changing their ſhell is generally the firſt morſel that ſerves to glut the new.

When the offspring of theſe creatures firſt leave their parents they immediately ſeek for refuge in the ſmalleſt clefts of rocks, and in ſuchlike crevices at the bottom of the ſea, where the entrance is but ſmall, and the opening can be eaſily defended. There, without ſeeming to take any food, they grow larger in a few weeks time, from the mere accidental ſubſtances which the water waſhes to their retreats. By this time alſo they acquire an hard, firm ſhell, which furniſhes them with both offenſive and defenſive armour. They then begin to iſſue from their fortreſſes, and boldly creep along the bottom in hopes of meeting with more diminutive plunder. The ſpawn of fiſh, the ſmaller animals of their own ſpecies, but chiefly the worms that keep at the bottom of the ſea, ſupply them with plenty. They keep in this manner cloſe among the rocks, buſily employed in ſcratching up the ſand for worms, or ſurpriſing ſuch heedleſs animals as fall within their reach, and leading a life of ſecurity, except from each other; for like other fiſh, the largeſt are the moſt formidable of all enemies to the ſmall.

The operation of changing the ſhell is not only very painful, but alſo very dangerous, for many of them die under it. For ſome days previous to the change the animal becomes torpid and motionleſs; juſt before caſting its ſhell it throws itſelf upon its back, ſtrikes its claws againſt each other, and every limb ſeems to tremble; its feelers are agitated, and the whole body in violent motion; it then ſwells to a great degree; the ſhell opens, firſt at the junctures of the belly; and by a ſimilar operation it is diſcharged of its claws, and in a ſhort time the creature is at liberty, but ſo weak that it continues for ſome time motionleſs, poſſeſſing the ſoftneſs and timidity of a worm, and fall a prey by hundreds to the dog-fiſh, the cod, and the ray.

The ſtate of imbecility remains for a ſhort time, and when the lobſter is completely equipped in its new ſhell, it will appear to have increaſed above a third in its ſize; and we are aſtoniſhed how the deſerted ſhell could have contained ſo large an animal as that which entirely fills up the new.

To account for the ſpeedy growth of the ſhell, it is ſuppoſed that the lobſter poſſeſſes in itſelf a fluid of a petrifying quality;—but this is, in fact, only explaining one myſtery by another.

After what has been deſcribed, let us, in the words of Goldſmith, "pauſe a little, to reflect "on the wonders this extraordinary creature "offers to our imagination! an animal without "bones on the inſide, yet furniſhed with a ſtomach capable of digeſting the hardeſt ſubſtances, the ſhells of muſcles, of oyſters, and "even its own; an animal gaining a new ſtomach and a new ſhell at ſtated intervals; furniſhed with the inſtruments of generation "double in both ſexes, and yet with an apparent incapacity of uniting! Without red "blood circulating through the body, and yet "apparently vigorous and active! But moſt "ſtrange of all, an animal endowed with a vital principle that furniſhes ſuch limbs as have "been cut away, and keeps continually combating, though in conſtant repair, to renew "its engagements! Yet theſe are but a ſmall "part of the wonders of the deep, where Nature ſports without a ſpectator."

## AMPHIBIOUS ANIMALS.

LINNÆUS has given the name of Amphibia to his third claſs of animals, including all thoſe which partly live on land and partly in water.

It has been a queſtion whether the animals commonly called *amphibious* live moſt in the water or on the land: the literal meaning of the word, would imply, that animals having this title ſhould be capable of living as well by land, or in the air, as by water; or of dwelling in either conſtantly at will; but it will be difficult to find any animal that can fulfil this definition as being equally qualified for either. Dr. Parſons, in a paper read before the Royal Society, divides them into two orders, viz. 1. Such as enjoy their chief functions by land, but occaſionally go into the water. 2. Such as chiefly inhabit the water, but occaſionally go aſhore.

Of the firſt order, he particularly conſiders the *phocæ:*—but for this article we refer to Buffon's Natural Hiſtory.

Otters, beavers, and ſome kind of rats, go occaſionally into the water for their prey, but cannot remain very long under water.

Frogs, however capable of remaining in the water, yet cannot avoid living on land, for they reſpire; and if a frog be thrown into a river, he makes to the ſhore as faſt as he can.

The lizard-kind, ſuch as may be called the water-lizard, are all obliged to come to land, in order to lay their eggs, to reſt, and to ſleep. Even the crocodiles, who dwell much in rivers, ſleep and lay their eggs on ſhore; and, while in the water, are compelled to riſe to the ſurface to breathe; yet, from the texture of his ſcaly covering, he is capable of remaining in the water longer by far than any ſpecies of the phocæ, whoſe ſkin is analagous to that of a horſe or cow.

The teſtudo, or ſea-tortoiſe, though he goes out to ſea, and is often found far from land, yet being a reſpiring animal, cannot remain long under water. He has indeed a power of rendering himſelf ſpecifically heavier or lighter than the water, and therefore can let himſelf down to avoid an enemy, or a ſtorm; yet he is under the neceſſity of riſing frequently to breathe; and his moſt uſual ſituation while at ſea, is upon the ſurface of the water, feeding upon the various ſubſtances that float in great abundance every where about him; theſe animals float ſecurely upon the ſurface, but not under water; and can remain longer at ſea than any other of this claſs, the crocodile excepted, becauſe, as it is with the latter, his covering is not in danger of being too much macerated; yet they muſt go on ſhore to copulate and lay their eggs.

The animals of which we are now ſpeaking, have alſo been divided into ſuch as have lungs, and ſuch as want them. The firſt ſpecies differ ſo conſiderably from an ox, or any other quadruped, that a few obſervations may be ſufficient to give an idea of their internal ſtructure; for this purpoſe, we ſhall firſt examine that ſpecies of them which moſt reſembles man in the internal ſtructure.

The *tortoiſe*.—The covering of this animal is compoſed of a ſhell ſo remarkably hard and firm in its texture, that a loaded waggon may go over it without hurting the ſhell, or the animal within it. In the young animal this ſhell grows harder in proportion as its contents expand; and this creature never changes its ſhell as ſome others do; hence it was neceſſary for it to be made up of different pieces; and theſe are more or leſs diſtinct in ſeveral animals. Their feet are ſmall and weak; and they are exceedingly ſlow in motion.

It has neither tongue nor teeth; to make up for which, their lips are ſo hard as to be able to break almoſt the hardeſt bodies.

The alimontary canal very much reſembles that of the former claſs.

The principal difference is in the circulation of the blood. The heart has two diſtinct auricles, without any communication; and under theſe, there is the appearance of two ventricles, ſimilar in ſhape to thoſe of the former claſs: but they may be conſidered as one cavity; for the ventricle ſends out not only the pulmonary artery, but likewiſe the aorta; for there is a paſſage in the ſeptum, by which the ventricles communicate freely, and the blood paſſes from the left into the right one. From the aorta the blood returns into the right auricle, while that, from the pulmonary artery returns to the left auricle, from which it is ſent to the left ventricle, &c. ſo that only a part of the blood is ſent to the lungs, the reſt going immediately into the aorta; hence the animal is not under the neceſſity of breathing ſo often as otherwiſe it would be.

From the baſe of the right ventricle goes out the pulmonary artery and aorta. The pulmonary artery is ſpent upon the lungs. The aorta may be ſaid to be three in number; for the aorta ſiniſtra aſcends through the pericardium in company with the pulmonary artery; and afterwards turns down, and ſends off a conſiderable branch, which ſplits into two; one of which joins the right aorta, while the other is diſtributed upon the liver, ſtomach, inteſtines, &c. What remains of this aorta, runs to the kidneys, or poſterior extremities of that ſide. An aorta deſcendens, &c. after piercing the pericardiums, runs down and communicates with the branch already mentioned, is diſtributed upon the right kidney, and inferior extremity, and alſo upon the bladder, or parts of generation. An aorta aſcendens, after getting out of the pericardium, ſupplies the fore-legs, neck, and head. The blood in the ſuperior part of the body returns to the right auricle by two jugular veins, which unite after perforating the pericardium. From the inferior part it returns to the ſame auricle by two large veins; one on the right ſide receives the blood in the right lobe of the liver; the other on the left ſide, receives the blood in the left lobe, and alſo a trunk which correſponds with the inferior vena cava in other animals. The pulmonary veſſels run in the left auricle in the common way.

The abſorbent ſyſtem in the turtle, like that in the former claſs, conſiſts of lacteals and lymphatics, with their common trunks the thoracic ducts; but differs from it in having no obvious lymphatic glands on any part of its body, nor plumes formed at the termination in the red vein.

The *lacteals* accompany the blood-veſſels upon the meſentery, and form frequent networks acroſs theſe veſſels; near the root of the meſentery, a place is formed which communicates with the lymphatics coming from the kidneys and parts near the anus. At the root of the meſentery on the left ſide of the ſpine, the lymphatics of the ſpleen join the *lacteals*; and immediately above this a plexus is formed, which lies upon the right aorta. From this plexus a large branch ariſes, which paſſes behind the right aorta to the left ſide, and gets before the left aorta, where it aſſiſts in forming a very large receptaculum, which lies upon that artery.

From this receptaculum ariſe the thoracic ducts. From its right ſide goes one trunk, which is joined by that large branch that came from the plexus to the left ſide of the right aorta, and then paſſes over the ſpine. This trunk is the thoracic duct of the right ſide; for having got to the right ſide of the ſpine, it runs upwards on the inſide of the right aorta, towards the right ſubclavian vein; and when it has advanced a little above the lungs, it divides into branches, which near the ſame place are joined by a large branch, that comes up on the right ſide of the aorta. From this part upwards, thoſe veſſels divide and ſubdivide, and are afterwards joined by the lymphatics of the neck, which likewiſe form branches before they join them from below. So that between the thoracic duct and the lymphatics of the ſame ſide of the neck, a very intricate net-work is formed; from which a branch goes into the angle between the jugular vein, and the lower part or trunk of the ſubclavian. This branch lies therefore on the inſide of the jugular vein, whilſt another gets to the outſide of it, and ſeems to terminate in it, a little above the angle, between that vein and the ſubclavian.

Into the above-mentioned receptaculum the lymphatics of the ſtomach and duodenum likewiſe

wiſe enter. Thoſe of the duodenum run by the ſide of the panecneas, and probably receive its lymphatics and a part of thoſe of the liver. The lymphatics of the ſtomach aud duodenum have very numerous anaſtomeſes, and form a beautiful net-work on the artery which they accompany. From this receptaculum likewiſe, (beſides the trunk already mentioned, which goes to the right ſide) ariſe two other trunks pretty equal in ſize; one of which runs upon the left ſide, and the other upon the right ſide of the left aorta, till they come within two or three inches of the left ſubclavian vein; where they join behind the aorta, and form a number of branches which are afterwards joined by the lymphatics of the left ſide of the neck; ſo that here a plexus is formed as upon the right ſide. From this plexus a branch iſſues, which opens in the angle between the jugular and ſubclavian vein.

*Serpent* and *Crocodile.*—The circulation in theſe is ſimilar to that of the turtle; but we find only one ventricle. The blood goes from the right auricle to the ventricle which ſends out the pulmonary artery and aorta; the blood from the pulmonary artery returns to the left auricle, that from the aorta going to the right auricle, and both the auricles opening into the ventricle.

*Frog* and *Lizard.*—Theſe differ from the former animals, in having only one auricle and a ventricle; and beſides the ventricle ſends out a ſingle artery, which afterwards ſplits into two parts; one to ſupply the lungs, the other runs to all the reſt of the body; from the lungs, and from the other parts, the blood returns into the auricle.

The conſideration of theſe is ſufficient to inform us of the nature of the firſt order of the claſs of amphibious animals; let us now ſee what is to be ſaid of the ſecond in our diviſion of them, which are ſuch as chiefly inhabit the waters, but occaſionally go on ſhore.

Theſe are but of two kinds; the eels, and water-ſerpents, or ſnakes of every kind. It is their form that qualifies them for loco-motion on land, and they know their way back to the water at will; for by their ſtructure they have a ſtrong periſtatic motion, by which they can go forward at a pretty good rate; whereas all other kinds of fiſh, whether vertical or horizontal, are incapable of a voluntary loco-motion on ſhore; and therefore, as ſoon as ſuch fiſh are brought out of the water, after having flounced a while, they lie motionleſs, and ſoon die.

Let us now examine into the reaſon why theſe vermicular fiſh, the eel and ſerpent kinds, can live a conſiderable time on land, and the vertical and horizontal kinds die almoſt immediately when taken out of the water. All land-animals have lungs, and can live no longer than while theſe are inflated by the ambient air, and alternately compreſſed for its expulſion; that is, while reſpiration is duly carried on, by a regular inſpiration and expiration of air.

In like manner, the fiſh in general have, inſtead of lungs, gills or branchiæ: and as in land animals the lungs have a large portion of the maſs of blood circulated through them, which muſt be ſtopped if the air has not a free ingreſs and egreſs into and from them; ſo, in fiſh, there is a great number of blood-veſſels that paſs through the branchiæ, and a great portion of their blood circulates through them, which muſt in like manner be totally ſtopped, if the branchiæ are not perpetually wet with water. So that, as the air is to the lungs in land-animals a conſtant aſſiſtant to the circulation, ſo is the water to the branchiæ of thoſe of the rivers and ſeas; for when theſe are out of the water, the branchiæ very ſoon grow criſp and dry, the blood-veſſels are ſhrunk, and the blood is obſtructed in its paſſage; ſo, when the former are immerſed in water, or otherwiſe prevented from having reſpiration, the circulation ceaſes, and the animal dies.

Again, as land-animals would be deſtroyed by too much maceration in water; ſo fiſhes would, on the other hand, be ruined by too much exſication; the latter being, from their general ſtructure and conſtitution, made fit to bear, and live in the water; the former, by their conſtitution and form, to breathe and dwell in the air.

But it may be aſked, why eels and water-ſnakes are capable of living longer in the air than the other kinds of fiſh? This is anſwered by conſidering the providential care of the great Creator for theſe and every one of his creatures: for ſince they were capable of loco-motion by their form, which they need not be if they were never to go on ſhore, it ſeemed neceſſary that they ſhould be rendered capable of living a conſiderable time on ſhore, otherwiſe their loco-motion would be in vain. How is this provided for? Why, in a moſt convenient manner; for this order of fiſh have their branchiæ covered, while thoſe of other kinds are much expoſed to the air, and want the ſlimy matter to keep them moiſt. Now, if any of theſe, when brought out of the water, were laid in a veſſel without water, they might be preſerved alive a conſiderable time, by only keeping the gills and ſurface of the ſkin conſtantly wet, even without any water to ſwim in.

It has been advanced, that *man* may, by art, be rendered amphibious, and able to live under water as well as frogs. As the fœtus lives *in utero* without air, and the circulation is there continued by means of the foramen ovale; by preſerving the paſſage open, and the other parts in *ſtatu quo*, after the birth, the ſame faculty would ſtill continue. Now, the foramen, it is alledged, would be preſerved in its open ſtate, were people accuſtomed, from their infancy, to hold their breath a conſiderable time once a day, that the blood might be forced to reſume its preſtine paſſage, and prevents it drying up as it uſually does.

This conjecture ſeems, in ſome meaſure, ſupported by the practice of divers, who are taught from their childhood to hold their breath, and keep long under water, by which means the ancient channel is kept open. A Calabrian monk at Madrid laid claim to this amphibious capacity, making an offer to the king of Spain to continue twice twenty-four minutes under water, without ever coming up to take breath. Kircher gives an account of a Sicilian, named the Fiſh-Colas, who, by a long habitude from his youth, had ſo accuſtomed himſelf to live in water, that his nature ſeemed to be quite altered; ſo that he lived rather after the manner of a fiſh than of a man.

## THE TURTLE AND TORTOISE.

TESTUDO is the general name which comprehends all thoſe names known in Engliſh by the names of turtles and tortoiſes; of which there are a great many ſpecies; ſome with four toes on each foot; others with five toes on the fore-feet, and four on the hinder ones; and others diſtinguiſhed by other peculiarities, particularly the compartments of their ſhells, ſome being divided into irregular ſpaces, and others beautifully teſſellated. The ſhells are much uſed in ornamental work.

The degree of ſtrength and docility poſſeſſed by the tortoiſe, and the warm red blood circulating in its veins, certainly give it an apparent claim to a rank above fiſh;—on the other hand, it is of an amphibious nature; it is covered with a ſhell like a lobſter, and it brings forth its young from the egg without hatching; theſe conſiderations tend to leſſen its ſuperiority, and degrade it among animals which in many reſpects it conſiderably ſurpaſſes.

A diſtinction has uſually been made between the ſpecies that live upon land and thoſe which ſubſiſt in the water; the former being called tortoiſes, the latter turtles. Sheba, however, aſſerts that all tortoiſes are amphibious; that the land-tortoiſe will live in the water, and that the ſea-turtle can be fed upon land. A land-tortoiſe was taken to him that had been caught in one of the canals of Amſterdam, which he kept for half a year in his houſe, where it lived very well contented in both elements. When in the water, he obſerved that it remained with its head above the ſurface; and when placed in the ſun-beams, ſeemed delighted with the warmth, and remained immoveable during its continuance. Habit, therefore, rather than conformation, conſtitutes the difference between theſe animals, which perhaps differ leſs than birds that live on the land and thoſe that ſwim in the water.

The moſt noticeable diſtinctions between theſe animals ſhall now be pointed out:—the firſt is in the ſize: the land-tortoiſe not generally exceeding three feet long by two feet broad;

but the turtle is ſometimes from five to ſeven feet long. Not that the ſize can be relied upon as an unerring diſtinction; for in many parts of India the land-tortoiſes grow to a very great magnitude, though not big enough for a ſingle ſhell to cover a houſe, as ſome of the ancients gravely aſſerted.

The methods of living are certainly a more obvious diſtinction than the ſize of turtles. The land-tortoiſe lives in holes dug in the mountains, or near marſhy lakes; the ſea-turtle in cavities of rocks and extenſive paſtures at the bottom of the ſea; this chiefly uſes its feet in ſwimming, creeping at the bottom; while the tortoiſe employs its feet to walk with, and burrow in the ground.

The land-tortoiſe has a ſmall head, ſomewhat reſembling that of a ſerpent; an eye without the upper lid; the under eye-lid ſerving to cover and keep that organ in ſafety. It has a ſtrong ſcaly tail like the lizard; it can at pleaſure put out or hide its head under the great penthouſe of its ſhell, where, defended on every ſide, it remains ſecure from all attack.—It lives chiefly on vegetable food, and never acts offenſively; though any of the ſmaller animals who invade its repoſe, ſuffer ſmartly for their temerity; for the tortoiſe is poſſeſſed of ſuch ſtrength of jaw, that though armed only with boney plates, inſtead of teeth, wherever it faſtens it infallibly keeps its hold till it has taken out the piece.

The longevity, and the difficulty of deſtroying theſe animals is indeed extraordinary: ſo much ſo, that we are almoſt tempted to adopt Goldſmith's aſſertion, that "*nothing can kill* "*them.*" When Rhedi was making ſome obſervations upon animal motion, he drew the brains from the head of a land-tortoiſe, by making a large opening in its ſkull, and waſhed the cavity ſo as not to leave the ſmalleſt part remaining: and then, leaving the hole open, ſet the animal at liberty—"notwithſtanding which "the tortoiſe marched away, without ſeeming "to have received the *ſmalleſt injury:—only it* "*ſhut the eyes, and never opened them after-* "*wards.*"

The hole in the ſkull, we are told, was ſeen to cloſe, and in three or four days there was a complete ſkin covering the wound. In this manner the animal lived *without a brain* for ſix months, walking about unconcernedly, and moving its limbs as before.

The humanity of the Italian philoſopher was not ſatisfied with this experiment, for he carried it a degree farther:—“ he *cut off the head*, and “ the animal lived twenty-three days after its “ ſeparation from the body. The head alſo “ continued to rattle the jaws, like a pair of “ caſtenets, for above a quarter of an hour.”

Such is the longevity of turtles, that they are commonly known to exceed eighty years of age; and Goldſmith ſays there was one kept in the Archbiſhop of Canterbury's garden at Lambeth, that was remembered above an hundred and twenty. It was at laſt killed by the ſeverity of a froſt, from which it had not ſufficiently defended itſelf in its winter retreat, which was an heap of ſand at the bottom of the garden.

This principle of vitality ſeems not eaſily to be accounted for, as its food is the ſimpleſt poſſible, though in its choice not very delicate; it indifferently feeds on leaves, fruit, corn, &c. and uſually fills itſelf with whatever offers.

Like the bat, the ſerpent, the lizard, and ſome other animals, the tortoiſe retires to ſome cavern to ſleep for the winter; and at the time that food is no longer in plenty, the tortoiſe becomes inſenſible to its want; but it is ſufficiently attentive to make its retreat as comfortable as poſſible, by furniſhing it with moſs, graſs, and other ſubſtances, as well for warmth as proviſion, ſhould it prematurely awake from its repoſe, which ſeldom happens, however, until the genial return of ſpring, with ſcarcely any diminution of its weight from its long confinement.

Soon after its return from torpidity, it prepares for the continuance of its ſpecies; but as all its actions are ſlow, and adapted to a creature of great longevity, ſo the genial embrace is ſaid to be of proportional duration. The amount of the land-tortoiſe's eggs are not aſcertained, but from the ſcarcity of the animal they cannot be ſuppoſed to be very numerous.

Previous to the depoſition of her eggs, the female tortoiſe ſcratches a ſlight hole in ſome warm ſituation, where the beams of the ſun have their whole effect ; there ſhe leaves them, covered with graſs and leaves, to be hatched by the heat of the ſeaſon. In about twenty-ſix or thirty days the young tortoiſes are excluded, and no ſooner quit the egg, than they ſeek after proviſion, the ſhell which covers them expanding with their growth.

The tortoiſe is ſuppoſed to deſtroy inſects and ſnails in great abundance; it is therefore taken into gardens; and in hot countries they are admitted into a domeſtic ſtate, as being great deſtroyers of bugs. Almoſt every family at the

Cape of Good Hope keeps a ſmall land-tortoiſe in the incloſed yard, behind the offices of the houſe, for the purpoſe of avoiding the peſt of rats, which will not approach any place where the land-tortoiſe is harboured. One of theſe creatures was, ſome few years ago, very ſucceſsfully kept, for the ſame purpoſe, in a ſmall back garden of a houſe in Henrietta-ſtreet, Covent-Garden. How they can be expert at ſuch work as catching vermin, is not eaſy to be conceived; but they appear in general harmleſs, and even fond of employment.

Walcott mentions the African tortoiſe, (*teſtudo Græca*); the ſhell of a greeniſh yellow; the ſcales on the back marked irregularly in the diſk and edge, and the ſide ones obliquely with black; down the belly are two broad black ſtripes; tail ſhort, no toes, five claws to the fore-feet, four to the hind. It inhabits Africa, feeds on vegetables, moves ſlowly, partly owing to the ſide bend of the legs; at the approach of winter buries itſelf in the earth, where it paſſes that ſeaſon in a torpid ſtate. Its fleſh is reckoned more palatable than the *turtles* of the Mediterranean.

The torpidity, or ceſſation from taking food, of the tortoiſes during a portion of the winter

months,

months, is among the moſt ſingular of their peculiarities: though in the animal creation we obſerve ſeveral other inſtances of long abſtinence. It is the natural courſe for divers ſpecies to paſs four, five, or ſix months every year without either eating or drinking: beſides the tortoiſe, the bear, dormouſe, ſerpent, ſwallow, fly, &c. are obſerved regularly to retire, at theſe ſeaſons, to their reſpective cells, and hide themſelves, ſome in the caverns of rocks, or ruins; others dig holes under ground; others get into the woods, and lay themſelves up in the clefts of trees; and ſome are ſuppoſed to bury themſelves under water.

In effect, ſeveral ſpecies of birds, almoſt the whole tribe of inſects, and many among the other tribes, are able to ſubſiſt all winter, not only without food, but many of them without reſpiration. This furniſhes an admirable inſtance of the wiſdom of the Creator: the proper food of theſe creatures, eſpecially of the inſect tribe, being then wanting, there is a proviſion for them to live without it. When the fields are diveſted of their flowery furniture, and the trees and plants are ſtripped of their fruits, what would become of ſuch animals as live upon the produce of ſpring and ſummer? And when the air is grown rigid and chilly with froſt, what would become of the many tender ſpecies who are impatient of cold? To prevent the total deſtruction and extirpation of many ſpecies of animals, the Author of Nature has provided that creatures thus bereaved of their food ſhould likewiſe be impatient of cold, to lead them thus to ſhelter themſelves out of the way of danger; and that when there arrived, the natural texture and viſcidity of the blood ſhould diſpoſe it, by a further degree of cold, to lag and ſtagnate in the veſſels; ſo that the circulation ſtopping, and the animal functions being in a great meaſure ſuſpended, there is no ſenſible waſte or conſumption of parts, but they remain in a kind of drowſy neutral ſtate, between life and death, until the warm ſun revives both them and their food together, by thawing the congealed juices both of ſuch animals and vegetables.

It is more than probable, that all motion of the animal juices is extinct in flies, and other inſects, when thus aſleep, becauſe, even when cut in pieces they do not awake, nor does any fluid ooze out of the wound, unleſs ſome extraordinary degree of warmth has been firſt applied to unbind the ice—The ſleep of ſuch animals is little elſe than death, and their waking a rea reſurrection—for if life does not conſiſt in the circulation of the blood, in what it does ſtill remains to be diſcovered. Hence it is no wonder that tortoiſes, dormice, bears, &c. are found as fat and fleſhy after ſome months *abſtinence* as before. Sir G. Ent weighed a tortoiſe he had ſeveral years ſucceſſively at its going to earth in October, and on its coming out again in March; and found that, of four pounds four ounces, it only uſed to loſe about one ounce. Philoſophical Tranſactions, No. 194.

Indeed we have inſtances of men paſſing ſeveral months as ſtrictly *abſtinent* as other creatures. The records of the Tower mention a Scotchman impriſoned for felony, and ſtrictly watched in that fortreſs for ſix weeks, in all which time he took not the leaſt ſuſtenance, and for which he had his pardon. The German Ephemerides ſpeak of one Martha Taylor, who, by a blow on the back, fell into ſuch a proſtration of appetite, that ſhe took no ſuſtenance, except a few drops with a feather, for thirteen months; but this was a morbid and unnatural caſe, for ſhe ſlept but little all the time. We may add the inſtance of S. Chiltow, of Tinſbury, near Bath, who, in the year 1693, 1694, and 1695, ſlept ſometimes four months, and ſometimes above ſix together, with very little food; and ſix weeks without any more than a little tent, conveyed with a quill into his mouth through a hole in his teeth. Philoſoph. Tranſact. No. 304.

It is to be added, that in moſt inſtances of long *abſtinence* related by naturaliſts, there were apparent marks of a texture of blood, and humours much like that of ſummer beaſts and inſects. Though it is no improbable opinion, that the air itſelf may furniſh ſomething for nutrition. It is certain there are ſubſtances of all kinds, animal, vegetable, &c. floating in the atmoſphere, which muſt be continually taken in by reſpiration. And that an animal body may be nouriſhed thereby, is evident in the inſtance of vipers, which, if taken when firſt brought forth, and kept from every thing but air, will yet grow very conſiderably in a few days. So the eggs of lizards are obſerved to increaſe in bulk, after they are produced, though there be nothing to furniſh the increment but air alone; after the like manner, as the eggs or ſpawn of fiſhes grow, and are nouriſhed with the water. And hence, ſay ſome, it is that cooks, turnſpit dogs, &c. though they eat but little, yet are uſually fat.

The *turtle* is found much larger than the land-tortoiſe:—the ſea, indeed, is poſſeſſed of the property of increaſing the magnitude of animals congenial to that element. The great Mediterranean turtle is the largeſt of the kind which we know of; but its utility is by no means proportioned to its ſize; it is ſo far unfit for food, that it is even ſaid to be poiſonous; and the ſhell, which reſembles an hide, is unfit for any uſeful purpoſe. One of theſe was caught in 1729, at the mouth of the Loire, nearly eight feet in length and two over, furniſhed with teeth in each jaw; and a tail quite diſengaged from the body, fifteen inches in length. Some others of this ſpecies have been ſince taken upon our coaſts, that weighed from ſeven to eight hundred weight; but an attempt to feaſt upon them has always been attended with diſagreeable, or rather almoſt fatal conſequences.

This is not the caſe with the different ſorts which are imported for the gratification of luxury, and which are become the favourite food of thoſe who are fond of eating a great deal without the danger of ſurfeiting.

Four ſpecies of turtle have been mentioned as caught in the South Sea and Indian Ocean, viz.

the *trunk turtle*, the *loggerhead*, the *hawkſbill*, and the *green turtle*.

Of the three firſt, the fleſh is very indifferent eating; but the ſhell of the hawkſbill ſerves for many valuable purpoſes. The ſubſtance of the other ſhells is thin and porous; that of the hawkſbill is firm, and when poliſhed is beautifully marbled, weighing from three to ſix pounds. The ſhell conſiſts of thirteen plates, or leaves, of which eight are flat, and five hollow; and are ſeparated by putting a fire under the ſhell when the fleſh is taken out, and by being ſcraped on both ſides, they become beautifully tranſparent.

The *green turtle* (Teſtudo Mydas) has the fore fins of an oblong oval; thoſe of the male furniſhed with two claws; hind fins broad and round at the end, with one claw; ſhell convex, ſmooth, of a reddiſh brown, broke with a yellow, and rayed with a deeper brown or black; ſutures of the ſhell and edge of the ſide-ſcales waved; belly a pale yellow.

In the Philoſophical Tranſactions for 1774, Article 32, we have an account of two new turtles, by Mr. Pennant:—one of them, which had never before been deſcribed, is found in freſh water, and is peculiar to the ſouthern rivers of America, particularly in Savannah and Altamaha rivers.

It is called the *ſoft-turtle ſhelled*, becauſe the covering looks like leather, and for the moſt part is very ſmooth and pliable. It is very ſwift, and very fierce, and from various ſizes to ſeventy pounds weight.

The colouring of the ſhell is a dark brown, with a ſlight tinge of green. The middle part is ſtrong and boney, but round the ſides and towards the tail it is cartilaginous, ſoft and pliable, reſembling thin tanned ſole leather. All the hinder part of the back is full of oblong ſmooth knobs, and the fore part is ſtudded with knobs of a larger ſize.

The inſide of it is very beautiful, of a bright whitiſh colour, interſperſed with innumerable ramifications of blood-veſſels. The under part of this ſhell, or coat, is white, and reaches two or three inches farther forward than the other, ſo that it affords reſt and ſupport for the head. The hinder part is hard and boney, and in ſhape reſembles a ſaddle, with two pieces for the thighs to reſt on. The fore-part is pliable and cartilaginous.

The head is ſomewhat triangular and lengthened, and the neck is eaſily extended to a great length. The eyes are near to each other, and have large looſe palpebræ. The pupil is ſurrounded by a lemon-coloured iris, perfectly round, and giving much fire to the eyes. When the animal ſleeps, the looſe part of the lower palpebræ is brought over the eye, like the membrana nictitans of birds.

The noſtrils are the moſt ſingular; being, in an animal which weighed only twenty pounds, a cartilaginous production, of at leaſt three-fourths of an inch beyond the upper and fore angle of the upper lip, perforated with two apertures, which reach back, and open into the roof of the mouth, having a ſmooth ſeptum on each ſide.

The arms are thick and ſtrong, conſiſting of three diſtinct joints, the upper, the fore arm, and the hand. The hands have each five fingers; the legs reſemble the arms. The tail is large and thick; and the fleſh a greater delicacy than even the green turtle.

The *tuberculated turtle*, Mr. Pennant ſuppoſes to be the teſtudo coriana of Linnæus; but he is not acquainted with its place and hiſtory. It is ſomewhat more than three inches long, and an inch and an half broad. The back is divided lengthways by five prominent ribs, covered with large yellow tubercles. The whole circumference of the back is alſo bounded by a tuberculated rib, and the coat, or ſhell, is in all its parts pliable.

The belly is yellow, tuberculated like the back, and marked with ſix rows, greatly prominent, and has four fins, but neither toes nor nails on either of them.

Some of our ancient travellers have aſſerted, that the turtle was delicious, while others as ſtrongly aſſert that it is poiſonous: this contradiction is eaſily ſolved by recurring to what we have ſaid of the Mediterranean turtle; and it was by ſlow degrees only that the diſtinction came to be made between ſuch as were malignant and ſuch as were wholeſome: this knowledge we chiefly owe to Dampier, who recommends the green turtle to be ſalted up for ſhip's proviſions in caſe of neceſſity, though he hardly could foreſee that this animal ſhould make its way to the luxurious tables of Europe, and by that means gluttony be freed from one of its greateſt reſtraints, the danger of a ſurfeit. And yet, to eat this creature in perfection, an epicure ſhould take a voyage to the Weſt-Indies; for, even after the beſt contrivances to import them in ſafety and vigour, yet they are generally battered and lean on their arrival.

From the general appetite for devouring this animal, they are not only thinned in their numbers, but much more ſhy; and their bulk, if we can credit the teſtimony of ancient writers, is much leſs than formerly; a circumſtance attributable to the ſame cauſe. Dampier ſpeaks of one taken at Port Royal, in Jamaica, that was ſix feet broad acroſs the back; and that a boy about ten years of age ſailed in the ſhell as in a boat, from the ſhore to his father's ſhip, which was about a quarter of a mile from land. Yet Diodorus Siculus, Ælian, and Pliny, repreſent the turtles of their days as much larger —prodigiouſly ſo indeed!—for a certain people in Ethiopia, after eating the fleſh made a tent of the ſhell. And in the iſland of Taprobane, (an iſland in the Indian ſea) the houſes were uſually covered with a ſingle ſhell. The greateſt ſize ſpoken of by modern writers is on the Iſle of Cuba, where they grow ſo large, that five men can ſtand upon the back of them together; yet this is a very uncertain way of eſtimating their dimenſions.

This creature differs from thoſe amphibious animals which occaſionally reſide in the water, as it ſeldom quits the ſea but to depoſit its eggs, or to ſport in freſh water. It is on their excurſions to lay, when they are uſually fat and healthy, that the turtles are commonly taken, and in the following manner, at leaſt upon thoſe uninhabited iſlands to which the green turtle chiefly reſorts.

The men employed on this buſineſs land about night fall, and keep perfectly ſtill when they ſee the turtle coming on ſhore. When ſhe has proceeded to her greateſt diſtance from the ſea, and when ſhe is moſt buſily employed in ſcratching a hole in the ſand, they ſally out and ſurpriſe her. Father Labat, on whoſe authority we here ſpeak, ſays, that their manner is to turn her upon her back, which utterly incapacitates her from moving; and yet, as the creature is very ſtrong, and ſtruggles very hard, two men find it no eaſy matter to lay her over. When thus ſecured, they go to the next, and, in this manner, in leſs than three hours, they have been known to turn forty or fifty turtles, each of which weighs from an hundred and fifty to two hundred pounds. The ſame writer aſſures us, that when the animal is in this helpleſs ſituation, it is heard to ſigh very heavily, and even to ſhed tears.

The chief food of the turtle is a ſubmarine plant, that covers the bottom of ſeveral parts of the ſea, not far from the ſhore; though they often ſeek their proviſions among the rocks, feeding upon the moſs and ſea-weed; and probably ſometimes upon inſects and other ſmall animals. According to the relation of navigators, when the ſea is calm, and the weather ſerene, the tortoiſes are ſeen feeding on the green carpet at the bottom of the ſea, where the depth is but a few fathoms:—after they have fed ſufficiently, they take their progreſs into the outlets of rivers for freſh water; there they take in a refreſhing air, and then return to their former ſtation. In the intermiſſion of their feeding, they generally float with their heads above the ſurace of the water, unleſs they are alarmed by the motions of any hunters or birds of prey, in which caſe they ſuddenly plunge to the bottom.

Their time of coupling is from March till May; and their intercourſe is of great duration: on this occaſion they reſort to low, flat, ſandy coaſts, as the ſand ſeems a very convenient receptacle for their eggs; and in purſuit of a proper or favourite ſituation, they often take very conſiderable voyages.

Their eggs are always depoſited in cavities, in the ſand, a little above the edge where the ſurges beat, and cover them very lightly, that the ſun may communicate to them a gentle warmth, and hatch their young; whilſt they are making preparation for their family, they furniſh mankind and birds with a very plentiful proviſion; for they lay their eggs thrice, at the expiration of every fifteen days, and generally produce fourſcore or ninety, or even more, at each fecundation.

When the creature has ſelected a ſpot for her neſt, which is generally done about the cloſe of evening, ſhe returns without laying that night; but on the next goes to depoſit a part of her burthen; and having ſcraped a round hole about one foot diameter, and a foot and a half deep, ſhe leaves about eighty or ninety eggs, which are laid in about the ſpace of an hour, each nearly as big as an hen's egg.

At the concluſion of about twenty-five days the young tortoiſes are ſeen to riſe out of the ſand, and, without any guide or inſtructions, march with a gentle pace to the water, but the waves unfortunately throw them back on the ſhore for the firſt few days, and then the birds dart upon them, and carry off the generality,

lity, before they have ſufficient ſtrength to make proper efforts againſt the ſurges, and dive to the bottom. So that out of three hundred eggs, it is but ſeldom that more than ten eſcape, and ſometimes they are all deſtroyed.

It ſhould ſeem, at the firſt view, that Nature, in this inſtance, charges herſelf with an unneceſſary expence, or is even imperfect in her operations. But the falſehood and injuſtice of ſuch an opinion is immediately evident. We never complain of the fertility of the hen, who frequently preſents us with near an hundred eggs in a year, when not one chick is permitted to be hatched. We are very ſenſible that the intention of the Author of Nature, in this admirable prolificneſs, is to facilitate the preſervation of the ſpecies, and, at the ſame time, to accommodate man and other animals with an excellent food: ſo that nothing in the works of Nature is either loſt or defective; and particular advantages are derived even from the ſlowneſs of a tortoiſe's motions; for were ſhe more expeditious, what a number of animals would be fruſtrated of their food?

Among the enemies which the young turtles have to fear, the parents themſelves have been mentioned by ſome ancient writers, who ſay that the mother waits for their arrival at the edge of the deep, and devours as many as ſhe can. This circumſtance is not well confirmed; though it is known that the crocodile acts in the ſame unnatural manner.

The calls of luxury have excited a variety of inventions to take theſe creatures; ſometimes, when coupled together, by throwing a nooſe round their feet or neck: ſometimes by ſtriking them with a harpoon; and ſometimes by diving underneath them, and ſeizing them by the tail when aſleep on the ſurface of the water, having a boat ready to receive them.

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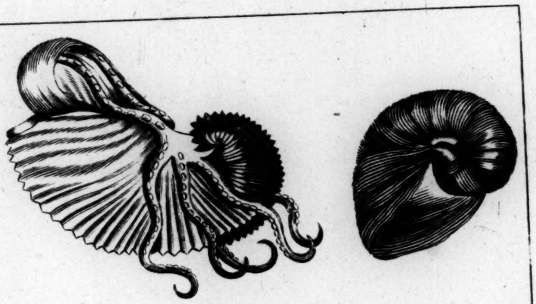
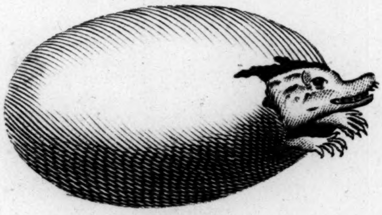
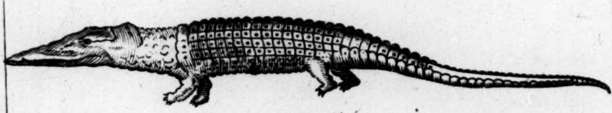


*Nautilis.*



*Crocodile's Egg.*



*Crocodile.*

## THE CROCODILE.

THIS animal has been uſually placed among the lizard tribe; though we have preſumed here to deviate from that arbitrary arrangement, and deſcribe it with the amphibious creatures. The tail is two-edged, the feet triangular; the fore ones having five, and the hinder only four toes.

Within the mouth of this beaſt are two jaws of pointed teeth; its eyes are large, fiery, projecting out of the head, and ſecured within an oſſeous orbit, but immoveable, ſo that they can only ſee as they walk ſtraight forward. The upper part of the ſnout and forehead conſiſts of one fixed bone, reaching to the ears, which are broad, ſurrounded with a little border, and growing near the joint of the upper jaw, where alſo the largeſt ſcales begin. The upper part of the body is fenced with chomboidical ſcales, ſo cloſely joined together, that no ſeparation is diſcernible, and a circular ſtreak on each.

They are of a deep ſaffron yellow, mixed with a dark bay. All along the ſides and back, to the end of the tail, are dented ranges of boſſes. The ſcales on its thighs, legs, and toes, are beautifully variegated with a light yellow, and bright cheſnut. Some crocodiles have five toes, both on their fore and hind feet, others have only four toes on their hind feet, but the fore feet have univerſally five toes, with pointed and crooked nails; ſo that in reality they are not ſo much like the foot of a beaſt as a man's hand with the four fingers and thumb extended; beſides, in aquatic crocodiles, the toes of the hind feet are joined by a membrane like thoſe of geeſe.

They chiefly haunt ſuch large rivers as the Niger, Ganges, Nile, or near the ſea-ſhore; never launching out far, either for fear of other monſters, or the convenience of laying their eggs in the ſand to be hatched by the ſun; theſe are from twenty to fifty in number, in ſize equal to a gooſe egg, but the ſhell is more brittle: the contiguous tunicle is both thicker and tougher than that in a gooſe egg.

When the little animal has thruſt his head through theſe two, he is not able to get his fore feet and the reſt of his body out of the ſhell, for the navel-ſtring is connected with the yolk of the egg, and cloſely wrapt about the fœtus, being the conveyance of that nouriſhment whereby, at length, it gathers ſtrength entirely to free itſelf from every obſtruction. Thus the decreaſe of the yolk being the growth of the embryo, when it leaves the ſhell it carries along with it the remainder of the yolk, contained in a membrane faſtened to the navel-ſtring. Beſides this ſtring, there is another ligament, like the after-birth, the ends of which join to the inward tunicle, and to the belly of the fœtus. Upon its being hatched, the navel-ſtring and the after-birth detach themſelves from the parts to which they are connected, and the infant crocodile is then enabled to begin his life of rapine.

The Leviathan of Scripture has been a ſubject of diſpute among the learned; ſome fixing upon one of God's creatures for the animal intended by the ſacred writers, and ſome upon another. Dr. Shaw, who was doubtleſs well acquainted with eaſtern learning, is of opinion that the leviathan is no other than the crocodile, "which, from the ſcaly quality and hardneſs of "its coat, (or, in the language of Job, whoſe "ſcales ſo ſtick together, that they cannot be "ſundered) is in no danger of having his ſkin "filled with barbed irons, or his head with

" fiſh ſpears. The crocodile is of too great " weight and magnitude, likewiſe, to be drawn " out of the river, as fiſh uſually are, with a " hook. The crocodile then, from theſe ap- " poſite characters, may well be taken for the " leviathan, as deſcribed in the book of Job." This conjecture is alſo adopted in Calmet's Dictionary.

But the crocodile is a river animal entirely, and never found in the ſea; and yet, in the 104th pſalm, the leviathan is deſcribed to be an inhabitant of the great and wide ſea, of the ſame ocean that is navigated by ſhips. If the Royal Pſalmiſt's deſcription be ſtrictly appropriate, then the leviathan cannot be the crocodile.

A diſtinction which, perhaps, does not exiſt in nature, is ſometimes made between the crocodile and the alligator; the body of the crocodile is ſaid to be more ſlender than that of the alligator; its ſnout runs off tapering from the forehead, like that of a greyhound, while that of the other is indented, like the noſe of a lap-dog. The crocodile has a much wider ſwallow, and is of an aſh colour; the alligator is black varied with white, and is thought not to be ſo miſchievous; but theſe diſtinctions are probably no more than minute variations.

Of the hiſtory of all the ravenous or ſavage tribes of animal nature, the inhabitants of Europe are leaſt intereſted in that of the crocodile; for it is placed at a happy diſtance from cultivated ſociety:—Nor, indeed, is the crocodile at preſent that dreadful tyrant which formerly laid waſte the banks of the Nile, and excited whole countries to repreſs its ravages. To view it in its natural terrors, and committing unceaſing devaſtations, we muſt go to thoſe immenſe rivers that roll through the uninhabited regions of Africa and America; where the arts and induſtry of mankind have not operated to the deſtruction or the enfeeblement of all the greater animals.

In the river of the Amazons, and in the Niger, theſe terrible deſtroyers ſtill poſſeſs a reſidence; on the banks whereof they are found from eighteen to thirty feet long; they frequently lie cloſe to each other, and indolently baſk on the ſurface; ſo that a perſon not uſed to them might miſtake them for trunks of trees, covered with a rough and dry bark; the unhappy miſtake would too ſoon be diſcovered, for the torpid animal, at the near approach of any living thing, darts upon it with inſtant ſwiftneſs, and at once drags it down to the bottom.

In times of inundation the crocodile has been known to enter the cottages of the natives, where the dreadful viſitant ſeizes the firſt animal it meets with. There have been examples of their taking a man out of a canoe, although there were ſeveral others in it, and with ſuch dexterity as to prevent their giving him any aſſiſtançe.

The crocodile's conformation denotes amazing ſtrength in every part; the back-bone is cloſely jointed and firmly united; in both hind and fore-legs the muſcles are very ſtrong; its teeth are ſharp and very numerous, and its whole form is calculated to ſhew the power it contains to exerciſe its natural weapons, which are irreſiſtible; the principal of which is its tail; with a ſingle blow of that it has been known to overturn a canoe, and by that means come with more eaſe at the conductor.

Theſe animals very ſeldom leave the water, except to depoſit their eggs in the ſand, or much preſſed with hunger. They in general float along upon the ſurface, and devour whatever kind of living creature comes within their reach, but experiencing a ſcarcity on that element they approach the land, and lying quite under the banks, ſeize whatever animal comes to drink, by making a ſurpriſing ſpring, and, having made good its hold with both teeth and claws, it drags the victim under the water, and having thus drowned, devours it at eaſe.

There are various accounts given of the manner in which they are taken: in Siam, very ſtrong nets are placed acroſs the river at proper diſtances, where the creature, when caught, is ſuffered to exhauſt his ſtrength; the natives then approach him in boats, and wound him in ſeveral places, till he is perfectly weakened by loſs of blood; his mouth is then tied up, his head is faſtened to his tail, which is bent back like a bow, and he is otherwiſe ſecured, and when brought into ſubjection, is uſed to divert and entertain the great men of the Eaſt. It is managed, we are told by travellers like a horſe, having a curb in its mouth, and being directed as the rider thinks proper.—But in other parts of the world, as well as at Siam, the crocodile is an object of ſavage pomp; for Philips, a voyager to the Guinea coaſt, informs us that there are two pools of water near the royal palace at Sabi, where crocodiles are bred, as we breed carps in our ponds in Europe.

What we have been ſaying is applicable to the crocodiles only in unpeopled countries, where they retain their fierce and ſavage nature, and where they ſhew a contempt for man until they have experienced his powers of deſtruction; but wherever the crocodile has been harraſſed by mankind, its retreats invaded, and its numbers deſtroyed, it is there timorous and inoffenſive;—nay, not merely inoffenſive, for it is ſaid even to be cheriſhed and admired; and, in the oppoſite extreme, ſo gentle and inoffenſive are the crocodiles in the river San Domingo, that the children play with them, ride upon their backs, and even beat them without receiving the ſmalleſt injury.

The generation of the crocodile is very ſimilar in all reſpects to that of the turtle; except that at the period of vivification the female is inſtinctively taught that her young ones want relief, and ſhe goes on land to ſet them free. But no ſooner are they at liberty than they find their parent among the moſt unnatural of their enemies, and ſhe devours as many of them as ſhe is able.

But it is not the crocodile alone that thins their numbers: for to the negroes, a crocodile's egg is the moſt delicate morſel in the world;

and they neither ſpare pains nor labour to obtain this favourite repaſt. A particular ſpecies of the vulture, as we have already mentioned, alſo exerts its power in abridging the fecundity of the crocodile, attentively watching the female at the time of her laying, and flocking in great numbers upon the hidden treaſure; they tear up the eggs, and devour them in much ſhorter time than they were depoſited.

Notwithſtanding the extraordinary account given both by Linnæus and the moſt diſtinguiſhed naturaliſts, yet the fact of the crocodile's devouring her offſpring is doubted by ſome. There is one ſpecies of this creature called the open-bellied crocodile, which, like the opoſſum, is furniſhed with a falſe belly, into which the young creep when danger is apprehended: but probably this ſpecies is viviparous, and foſters her young, that are prematurely excluded, in this ſecond womb until they arrive at maturity.

Of the time theſe animals exiſt, there are many opinions among the ancients, who were extremely partial to the invention of fables reſpecting them; but the moſt likely is that of Ariſtotle, who ſuppoſes the term of their lives to be about that of the human ſpecies.

## TESTACEOUS FISH.

SYSTEMATIC diſtinctions, and ſpecific diviſions of things are uſeful in enlarging the comprehenſions of the mind; by methodizing the objects, they ſeem to extend the boundaries of knowledge; but having no real foundation in nature, they ſhould not be depended on too far;—for how apt we are to combine very diſſimilar objects in the ſame group, when hurried into the vortex of method, is evident from having placed the whale and the lippet, the tortoiſe and the oyſter in the ſame order of animated beings, merely becauſe they have one common abode.

Teſtaceous fiſh have been uſually divided into three kinds. The *univalve*, or *turbinated*, the *bivalve*, and the *multivalve*.

The ſhell may be conſidered as an habitation of the animal furniſhed by nature: part of the ſtony ſubſtance of which it is compoſed, the animal derives from outward objects; and the fluids of the animal itſelf furniſh the cement.

But to give a more exact idea of the manner in which ſea-ſhells are formed, we muſt begin with the animal in its earlieſt ſtate, and trace the progreſs of its ſhell from the time it firſt appears; for this purpoſe we ſelect the ſhell of the garden ſnail. The animal does not leave the egg till its little habitation is ſufficiently hardened. The beginning of the ſhell is not much larger than a pin's head, but grows in a very rapid manner, having at firſt but two circumvolutions, for the reſt are added as the ſnail becomes larger. In proportion as the ſnail encreaſes in ſize, the circumvolutions of the ſhell increaſe alſo, until the number of the volutes come to be five, which it never exceeds.

To Swammerdam, the Dutch naturaliſt, whoſe induſtrious reſearches deſerve the praiſe of every ſucceeding writer on the ſubject, we ſtand indebted for much of what we have to ſay on this head: The part, ſays he, where the animal enlarges its ſhell, is at the mouth, to which it adds in proportion as it finds itſelf ſtinted in its habitation below. Being about to enlarge its ſhell, it is ſeen with its little teeth biting and clearing away the ſcaly ſkin that

grow

grows at the edges. It is ſometimes ſeen to eat thoſe bits it thus takes off; at other times it only clears away the margin when covered with films, and then adds another rim to its ſhell.

For the purpoſe of making the ſhell, without which the animal could hardly exiſt a few days, the whole body is furniſhed with glands, from which flows out a ſlimy liquor, which in time (though perhaps not without the aid of ſome extraneous matter) acquires a ſtony hardneſs. And that gliſtening ſubſtance which the ſnail leaves in its track on the floor or a wall, is no other than the materials with which the animal adds to its ſhell, or repairs it when broken.

The extraneous matter which goes to the compoſition of the ſhell, or at leaſt to its external coat, which differs very evidently from the internal, is the accidental concretions of earthy or ſaline parts which adhere to the ſlimy matter on its firſt emiſſion.

Under this idea we can more ſatisfactorily account for the various colours of the ſhell, which cannot be ſuppoſed to take its tincture from the animal's body; for all the internal parts of the ſhell are but of one white colour; whereas on their outſides we find them of almoſt every colour but blue; and that they never preſerve any of the latter colour is eaſily to be accounted for, by the fact of ſea-water, urine, or nitre, entirely drawing it from any ſubſtance. Thus then we may eaſily ſuppoſe the various colours are produced, not only by the juices which the animal furniſhes, but from the mixture of ſea or earthy particles which unites with them; for neither the animal ſlime, nor the external earthy or ſaline particles could produce colours of themſelves, but being united, produce that variety which adorns the watery element; and it is not improbable that the nature of its food, as well as many external cauſes, may cooperate in contributing to its beauty.

But although the colouring of the ſhell is not to be entirely attributed to the animal itſelf, yet it certainly has the merit of giving it the general form, which ſolely depends upon the art, or rather inſtinct that Nature has beſtowed upon each diſtinct ſpecies, and from whence it is that in the ſame kinds, the ſhapes are conſtantly invariable. If their bodies poſſeſs any tumour or excreſcence, the incruſtaceous covering is ſurely to have one that correſponds; when the animal makes any addition to its apartment, the ſame protuberance which had raiſed the ſhell in its early days, ſwells it again at ſome little diſtance, by which means we ſee the ſame inequality in a ſpiral line all round the ſhell. In a word, if the body be channelled, the ſhell which covers it will be channelled, and if it has any protuberances, the ſhell will have them alſo in the exact ſize and ſhape.

Added to the beauty and diverſity of ſhells, their numbers almoſt exceed belief, for beſides thoſe found in the ſea, rivers, and with living animals upon land, they have been diſcovered in the bowels of the earth, forming banks of many fathoms in depth and breadth, and extending ſeveral miles in length: the latter of which, both from their multiplicity and great variety, were long conſidered by the greateſt naturaliſts as the capricious productions of Nature, never having been the habitation of an animal, nor been in any other ſituation than that in which they were diſcovered. But that opinion has long ſince been exploded, and it is now generally admitted, wherever found, or in whatever quantities, they are the ſpoils of ſome animals who once received ſhelter therein, and are compoſed of one and the ſame ſubſtance; namely, that they are formed of an animal, or calcareous earth, that ferments with vinegar, and other acids, and that burns into lime, and will not eaſily melt into glaſs:—this ſubject is moſt amply treated on by the Comte de Buffon, as may be ſeen in p. 219, vol. I. of Barr's Edition of that author's Natural Hiſtory.

Many perſons, ſtruck with the variety and beauty of ſhells, have made the collection of them the principal purſuit of their lives; it is true that ſuch purſuits are harmleſs and amuſing, but little knowledge can be drawn from the moſt extenſive cabinet of ſhells that ever were collected together; it is to thoſe men who have contemplated ſomething more than the outſides of theſe animals, that we muſt reſort to for information on their nature and hiſtory. Rheaumer paid great attention to their manners, and ſpent much time in examining and deſcribing them with accuracy; but to the indefatigable induſtry of Swammerdam, mankind are much more indebted for knowledge on this ſubject. The patience and perſeverance of this naturaliſt in the purſuit is almoſt beyond credibility: he had not only the difficulties attending the object, but alſo the prejudices of mankind to encounter, who were conſtantly ridiculing him for the undertaking. "It was in vain," ſays a judicious modern, "that Swammerdam's father diſſuaded him from what the world con-

" dered as a barren purſuit; it was in vain that " an habitual diſorder, brought on by his application, interrupted his efforts; it was in " vain that mankind treated him with ridicule " while living, as they ſuffered his works to remain long neglected and unprinted when " dead: ſtill the Dutch philoſopher went on " peeping into unwholeſome ditches, wading " through fens, diſſecting ſpiders, and enumerating the blood-veſſels of a ſnail; like the " bees, whoſe heart he could not only diſtinguiſh but diſſect, he ſeemed inſtinctively impelled by his ruling paſſion, although he found " nothing but ingratitude from man, and though " his induſtry was apparently become fatal to " himſelf."

Indifference, however, to the talents of this great naturaliſt no longer exiſts; his merit ſhone through the gleam that ignorance caſt round him, and his fame becomes more eſtabliſhed as his works are the more conſulted.

To his labours have all ſucceeding naturaliſts been indebted for the leading features in the hiſtory of animals that breed in ſhells; and though they have been able to relate more particulars, it was his genius that gave the clue to their diſcoveries; and therefore it is to him that we conſider ourſelves the moſt indebted for the contents of this part of our work.

In ſearching into the hiſtory of the *turbinated ſhell-fiſh*, or thoſe of the *ſnail-kind*, we are naturally led to bring forward at the head of them, the *garden-ſnail*, as one whoſe peculiarities it has been more eaſy to develope, than thoſe who are perfectly of a ſimilar form and nature, but whoſe reſidence is chiefly at the bottom of the deep. The ſnail, to the mere tranſient obſerver, appears to be little more than a lump of inactive matter, loaded with a cruſtaceous covering, and totally inſenſible to all the objects with which it is ſurrounded; but upon a more cloſe inſpection it will be found to be poſſeſſed of every faculty that can be poſſibly requiſite for the life it is formed to lead; that its organs of life are furniſhed in as ample a manner as are to be found in any animal of the largeſt dimenſions; that it has a tongue, brain, ſalival ducts, glands, nerves, ſtomach, and inteſtines; alſo liver, heart, and blood-veſſels, with a purple bag that ſupplies a red matter to different parts of the body, together with ſtrong muſcles that hold it to the ſhell, and which are hardened like tendons at their inſertion.

So far as it may be ſaid to poſſeſs qualities in common with other animals; but beſides theſe it has ſeveral peculiarities; the moſt ſtriking of which is the having its eyes placed on the points of the largeſt horns. When the ſnail is in motion four horns are plainly ſeen, the two topmoſt conſiderably bigger than the others, and at the extremities of thoſe are the two eyes, which appear like bright black ſpots; they are of a bulbous figure, have but one coat, and three humours, which are common in the eyes of other animals, namely, the vitreous, aqueous, and cryſtalline, are in theſe very indiſtinctly ſeen. The animal poſſeſſes the power of directing its eyes to any object it will, and to preſerve them from injury, can inſtantaneouſly contract them under the belly; under the ſmall horns is ſituated the mouth, and although the idea of teeth may appear inconſiſtent with an animal of ſuch ſoft ſubſtance, it nevertheleſs poſſeſſes no leſs than eight, with which it is enabled to devour leaves and many other ſubſtances ſeemingly harder than itſelf; nay, upon particular occaſions, it will even bite off pieces of its own ſhell with them.

The next peculiarity in the ſnail kind is their being both male and female, and that while it impregnates another, is capable of being impregnated itſelf. The veſſels which ſupply the fluid for generation are principally placed on the fore-part of the neck, and extend themſelves over the whole body; but the male and female organs are almoſt united and grow cloſe to each other. On the right ſide of the neck it has an opening which ſerves for very different purpoſes; in the firſt place it may be conſidered as the anus, it being the paſſage by which the excrements are excluded; next as a mouth, as through it the animal conſtantly reſpires; and laſtly as an organ of generation, which regularly dilates when the deſire of propagation begins; and within this opening every animal poſſeſſes thoſe parts neceſſary for the continuance of their ſpecies.

When the time of coition approaches, they gather together, placing themſelves quite cloſe to each other; and taking little or no nutriment for ſeveral days. Having in this time ſettled their bodies in that poſition for the head and neck to be upright, they mutually impregnate each other, the coupling of theſe animals is generally thrice repeated, and that at the diſtance of fifteen days.

At the expiration of eighteen days, from the laſt coition, they produce their eggs, which alſo come out of the above opening in the neck; theſe they hide with great caution and induſtry under the earth. Their eggs are round, white, and covered with a ſoft ſhell; they produce them in very great numbers, and they are ſtuck together by a kind of ſlime, not in a thick bunch, but rather, as it has been ſaid, like a bunch of grapes. On quitting the egg, the animal has a very ſmall ſhell on its back, with only one convolution; this very ſoon enlarges, and the circles encreaſe with the growth of the animal; never however exceeding four rounds and a half in the garden ſnail, though there are ſea ſnails which ſometimes have no leſs than ten. The firſt circle remains in its original ſtate, and the animal always adds to the ſhell at the mouth, which it encreaſes as it grows in ſize, and until it is ſufficiently large to contain its whole body.

The ſnail is poſſeſſed not only of a power of retreating into its ſhell, but of mending it when broken. Sometimes theſe animals are cruſhed ſeemingly to pieces; and to all appearance utterly deſtroyed; yet ſtill they ſet themſelves to work, and, in a few days, mend all their numerous breaches. The ſame ſubſtance by which the ſhell is originally made, goes to the re-eſtabliſhment of the ruined habitation. The ſhell thus mended has a mottled appearance, all the new pieces being much whiter than the old fabric.

The ſnail is very voracious. It chiefly ſubſiſts upon the leaves of plants and trees; but is very delicate in its choice. At the approach of winter, it buries itſelf in the earth, or retires to ſome hole, to continue in a torpid ſtate, during the ſeverity of the ſeaſon. It is ſometimes ſeen alone; but more frequently in company in its retreat; ſeveral being uſually found together, apparently deprived of life and ſenſation. For the purpoſes of continuing in greater warmth and ſecurity, the ſnail forms a cover or lid to the mouth of its ſhell with its ſlime, which ſtops it up entirely, and thus protects it from every external danger. When the cover is formed too thick, the ſnail then breaks a little hole in it, which corrects the effect of that cloſeneſs, which proceeded from too much caution. In this manner, ſheltered in its hole from the weather, defended in its ſhell by a cover, it ſleeps during the winter; and, for ſix or ſeven months, continues without food or motion, until the genial call of ſpring breaks its ſlumber, and excites its activity.

The ſnail, having ſlept for ſo long a ſeaſon, awakes one of the firſt fine days in April; breaks open its cell, and ſallies forth to ſeek for nouriſhment; and, unlike moſt other torpid animals, comes out much thinner than when it commenced its faſt. At firſt, it is not very difficult in the choice of its food; almoſt any vegetable that is green ſeems welcome; but the ſucculent plants in the garden are chiefly grateful; and the various kinds of pulſe are, at ſome ſeaſons, almoſt wholly deſtroyed by their numbers. A wet ſeaſon is generally favourable to their production; for this animal cannot bear very dry ſeaſons, or dry places, as they cauſe too great a conſumption of its ſlime, without plenty of which it cannot ſubſiſt in health and vigour.

Their method of proceeding from one place to another is by means of that broad muſcular ſkin which commonly projects round the mouth of the ſhell; this they put out as far as they are able, and then, by a kind of contraction, draw the ſhell after; beſides this they have a great advantage from the ſlime with which they are ſo copiouſly furniſhed; this they conſtantly emit whenever they move, and which not only ſmooths their way, but enables them alſo to aſcend or deſcend trees in ſearch of food, or wherever their inclinations direct them.

Theſe are the moſt ſtriking particulars in the hiſtory of this animal; and which may ſerve as a general a general picture to the manners and habitudes of the other tribes of this claſs. Theſe are, the ſea-ſnail, of which naturaliſts have, from the apparent difference of their ſhells, mentioned fifteen kinds; the freſh water ſnail, of which there are eight kinds; and the land-ſnail, of which there are five; all of which bear a ſtrong reſemblance to the garden ſnail in the formation of their ſhell, in their hermaphrodite natures, in the ſlimy ſubſtance (with which they are ſo amply ſupplied, and from which they derive ſo much aſſiſtance), in the peculiar opening in the neck, and in the mode of propagating their ſpecies.

But although poſſeſſed of theſe great reſemblances, yet the *water-ſnails*, both *river* or *ſea*, are found in ſome things to differ very materially. In the firſt place, all ſnails which live in water are furniſhed by Nature with a contrivance that enables them either to riſe to the ſurface, or ſink to the bottom of the water; this is performed by opening and ſhutting the orifice on the right ſide of the neck, which is ſupplied with muſcles for that purpoſe. The ſnail ſometimes gathers this aperture into an oblong tube, and ſtretches it above the ſurface of the water, in order to draw in, or expel the water, as it finds occaſion; by dilating this it riſes; by compreſſing it the animal ſinks to the bottom; of which we may have a thorough conception by referring to little glaſs images put in a tube of water, which are made to riſe or ſink by preſſing the air contained at the mouth of the tube.

This ſtriking difference between the freſh-water and the garden ſnail, is not, however, general in thoſe of the ſea kind; among which there are ſome that are found viviparous, while others lay eggs in the uſual manner. But this is not the only difference between land and ſea ſnails. They are, it is true, all hermaphrodites, but ſtill their nature of coition is by no means the ſame, for by the ſituation of the parts of generation the one cannot be impregnated by that which is empregnating, but a third is abſolutely neceſſary, and Mr. Adanſon ſays, he has ſeen a vaſt number of ſea-ſnails faſtened together, like a chain, impregnating each. Many of the latter alſo entirely want horns, and none of them have above two. Indeed, if the horns of ſnails be furniſhed with eyes, and if, as ſome are willing to think, the length of the horn, like the tube of a teleſcope, aſſiſt viſion, theſe animals that chiefly reſide in the gloomy bottom of the deep, can have no great occaſion for them. Eyes would be unneceſſary to creatures whoſe food is uſually concealed in the darkeſt places; and who, poſſeſſed of very little motion, are obliged to grope for what they ſubſiſt on. To ſuch, eyes would rather be an obſtruction than an advantage; and perhaps even ſnails that live upon land, are without them.

There is a difference alſo in the poſition of the mouth, in the garden and the water ſnail. In the former, the mouth is placed croſs-wiſe, as in quadrupeds; furniſhed with jaw bones, lips, and teeth. In moſt of the ſea-ſnails, the mouth is placed longitudinally in the head; and, in ſome, obliquely, or on one ſide. Others, of the trochus kind, have no mouth whatſoever; but are furniſhed with a trunk, very long in ſome kinds, but ſhorter in others.

But a more particular difference is the water-ſnails being viviparous: they not only bring forth their young alive, but with their ſhells upon their backs; which, ſtrange as it may appear, is nevertheleſs the fact; and which we have inconteſtibly proved by an experiment of Swammerdam. He ſays, "On the twelfth of "March I began my obſervations on this ſnail,

" and collected a great number of the kind, " which I put into a large baſon filled with rain- " water, and fed for a long time with potter's " earth, diſſolved in the water about them. " On the thirteenth of the ſame month I open- " ed one of theſe nails, when I found nine liv- " ing ſnails in its womb ; the largeſt of theſe " were placed foremoſt, as the firſt candidates " for excluſion. I put them into freſh water, " and they lived to the eighteenth of the ſame " month, moving and ſwimming, like ſnails " *full grown*; nay, their manner of ſwimming " was much more beautiful."

The *trochus*, commonly conſidered of the ſnail ſpecies, has no mouth whatever, but ſimply a kind of trunk, which in proportion to the ſize of the animal is very long ; this trunk is fleſhy, muſcular, ſupple, and hollow ; its extremity is bordered with a cartilage, and toothed like a ſaw. Theſe ſnails are a predatory ſpecies, and very juſtly been ſtated to be among the ſhelly tribe, what the tiger, eagle, and ſhark are to beaſts, birds, and fiſh. The whole race of ſhelled animals, with every poſſible means, endeavour to avoid their approach, conſcious, as it were, that whatever may be their ſize, their deſtruction is inevitable, as the ſtrongeſt covering is not proof againſt the power of this rapacious enemy. The ſhell of the trochus is very thick, and they are very clumſily formed, yet they proceed with greater ſwiftneſs than almoſt any other ſhell-fiſh, ſeize their prey with aſtoniſhing facility, and ſcarcely ever ſuffer the object they once have in purſuit to eſcape. The bulk of their intended victim does not appear to be of the ſmalleſt conſequence, for they attack the largeſt with the ſame boldneſs as they do one of the moſt inferior ſize. Having once cloſed on the ſhell, however thick, they almoſt inſtantaneouſly penetrate with their augur-like trunk. Thus fixed, all efforts to eſcape on the part of the other is entirely uſeleſs; if it expands, and comes to the ſurface, the trochus comes up alſo; and if it plunges to the bottom, the fell deſtroyer ſtill maintains its hold. In this manner it will adhere, until with its trunk it has ſucked all the ſubſtance of the other fiſh, even for days and weeks; nor ever quit its prey until it has ſo done, unleſs the other begins to putrefy.

That almoſt the whole tribe of ſhell-fiſh are ſubject to the attacks of the trochus is fully demonſtrated by the fact, that there is ſcarcely ever a ſhell met with that is entirely ſound to the end of its convolutions. The thinneſt ſhells are found to be the moſt penetrated, and this is readily to be accounted for: they being the moſt eaſily pierced, the predatory ſhell-fiſh, or the ſea-worms, chiefly ſeek them out for ſubſiſtence; and thus it is that not one in a thouſand of the thin paper-like ſhells, however ſmall, is found that has not ſuffered ſome diſaſter. The only chance theſe have of eſcaping is in their lightneſs ſometimes enabling them to outſail their heavy purſuers; and this had led moſt naturaliſts to conclude, (together with the fact that the food of all ſnails properly lays at bottom) that "when the thin-ſhelled fiſh are ſeen buſily "ſwimming at the ſurface, inſtead of ſporting "or ſunning themſelves, as ſome have ſuppoſ-"ed, they are actually labouring to eſcape "their moſt dreadful purſuers."

The *nautilus*, of all the ſnail kind, has the thinneſt ſhell, and is the moſt frequently ſeen ſwimming upon the ſurface; but whether it is at thoſe times employed in ſeeking its food, or endeavouring to eſcape its numerous enemies, as above conjectured, we ſhall not preſume poſitively to decide; it is ſufficient to obſerve, that the latter is the moſt probable, as upon opening the ſtomach, it is found to contain chiefly that food which it finds at the bottom.

This animal's induſtry may, therefore, be owing to its fears; and all thoſe arts of ſailing which it has taught mankind, may have ariſen from the effects of its own neceſſity. Although there are ſeveral ſpecies of the nautilus, yet they may be divided into two: the one with a white ſhell, as thin as paper, which it often is ſeen to quit, and again to reſume; the other with a thicker ſhell, ſometimes of a beautiful mother-of-pearl colour, and that quits its ſhell but rarely. This ſhell outwardly reſembles that of a large ſnail, but is generally ſix or eight inches acroſs: within it is divided into forty partitions that communicate with each other by a kind of doors, through which one could not thruſt a gooſe-quill: almoſt the whole internal part of the ſhell is filled by the animal, the body of which, like its habitation, is divided into as many parts as there are chambers in its ſhell: all the parts of its body communicate with each other, through the doors or openings, by a long blood-veſſel, which runs from the head to the tail; thus the body of the animal, if taken out of the ſhell, may be likened to number of ſoft bits of fleſh, of which there are forty threaded upon a ſtring. From this extraordinary conformation, one would not ſuppoſe that the nautilus ſometimes quitted its ſhell, and returned to it again; yet nothing, though ſeemingly impoſſible, is more certain. The manner by which it contrives to diſengage every part of its body from ſo intricate an habitation; by which it makes a ſubſtance, to appearance as thick as one's wriſt, paſs through forty doors, each of which would ſcarcely admit a gooſe-quill, is not yet diſcovered: But the fact is certain, for the animal is often found without its ſhell, and the ſhell more frequently deſtitute of the animal. It is moſt probable, that it has a power of making the ſubſtance of one ſection of its body removed up into that which is next; and thus, by multiplied removals, it gets free.

But this, though very ſtrange, is not the peculiarity for which the nautilus has been the moſt diſtinguiſhed. Its ſpreading the thin oar, and catching the flying gale, to uſe the poet's deſcription of it, has chiefly excited human curioſity. Theſe animals, particularly thoſe of the white, light kind, are chiefly found in the Mediterranean; and ſcarce any who have ſailed on that ſea, but muſt have often ſeen them. When the ſea is calm, they are obſerved floating on the ſurface; ſome ſpreading their little ſail; ſome rowing with their feet, as if for life and death; and others ſtill, floating upon their mouths, like a ſhip with the keel upwards. If taken while thus employed, and examined, the extraordinary mechaniſm of their limbs for ſailing will appear more manifeſt. The nautilus is furniſhed with eight feet, which iſſue near the mouth, and may as properly be called barbs: theſe are connected to each other by a thin ſkin, like that between the toes of a duck, but much thinner, and more tranſparent. Of theſe eight feet thus connected, ſix are ſhort, and theſe are held up as ſails to catch the wind in ſailing: the two others are longer, and are kept in the water; ſerving, like paddles, to ſteer their courſe by. When the weather is quite calm, and the animal is purſued from below, it is then ſeen expanding only a part of its ſail, and rowing with the reſt: whenever it is interrupted, or fears danger from above, it inſtantly furls the ſail, catches in all its oars, turns its ſhell mouth downward, and inſtantly ſinks to the bottom. Sometimes alſo it is ſeen pumping the water from its leaking hulk; and when unfit for ſailing, deſerts its ſhell entirely. The forſaken hulk is ſeen floating along, till it daſhes, by a kind of ſhipwreck, upon the rocks of the ſhore.

Such are the various manners in which the nautilus is conſtantly ſeen exerciſing itſelf in the Mediterranean ſea; and conſidering them in every point of view, we feel ourſelves inclined to join in opinion with thoſe naturaliſts who have concluded that the animal by thoſe efforts is endeavouring to ſave itſelf from the rapacity of its purſuers, rather than ſeeking for food, or wantonly ſporting on the ſurface of its natural element. And this concluſion they have drawn from the certain fact, that no animal of the ſea has ſuch a number of deadly enemies; ariſing principally, as we before remarked, from the thinneſs of its ſhell, which is ſcarcely ever found in perfect preſervation, but in general with ſome conſpicuous marks of having been hoſtilely invaded. The trochus, crab, ſea-ſcorpion, ſea-worm, and a variety of other predacious creatures that lurk at the bottom of the deep, are its conſtant and invariable foes, and from whom it has no chance of eſcaping but by that comparative ſwiftneſs which it derives from its lightneſs, and thoſe little arts above referred to, which have often been contemplated with equal pleaſure and aſtoniſhment.

The whole tribe of the ſnail kind have more to apprehend from their own ſpecies than is the caſe with that of any other animal, for, with ſcarcely an exception, they will attack and deſtroy each other, and that too in preference to ſeeking any different kind: the thin-ſhelled and weak, fall a prey to the more powerful, and thoſe which are completely covered with a ſhell, even though cloſed at its mouth, find no ſecurity from the rapacity of the trochus.

We now come to the *bivalved ſhell-fiſh*, or thoſe of the *oyſter* kind; and which, in every reſpect are much inferior to thoſe we have juſt deſcribed, whether conſidered as to their ſenſations, powers of motion, or in their ſyſtem of generation; in the latter there is a moſt material difference, notwithſtanding all the animals of this claſs, as well as thoſe of the ſnail-kind, are hermaphrodite, but then the latter require the aſſiſtance of each other, for the propagating their ſpecies, whereas the bivalved tribe are completely endowed with powers for that taſk, each in its individual ſelf, and totally independent of any other. Their other differences will be ſufficiently apparent as we proceed, and therefore need not dwelling upon in this place.

The freſh water *muſcle* is generally placed foremoſt in this race, as poſſeſſing the common manners of the whole tribe, and being the one which, not only Swammerdam, but every other naturaliſt, found the moſt eaſy to procure, and conſequently the moſt eaſy to become acquainted with.

The *muſcle*, whether belonging to freſh or ſalt water, conſiſts of two equal ſhells, joined at the back by a ſtrong muſcular ligament, that anſwers all the purpoſes of an hinge. By the elaſtic contraction of this, the animal can open its ſhells at pleaſure, about a quarter of an inch from each other. The fiſh is fixed to either ſhell by four tendons, by means of which it ſhuts them cloſe, and keeps its body firm from being cruſhed by any ſhock againſt the walls of its own habitation. It is furniſhed, like all other animals of this kind, with vital organs, though theſe are ſituated in a very extraordinary manner. It has a mouth furniſhed with two fleſhy lips; its inteſtine begins at the bottom of the mouth, paſſes through the brain, and makes a number of circumvolutions through the liver; on leaving this organ, it goes on ſtraight into the heart, which it penetrates, and ends in the anus, near which the lungs are placed, and through which it breathes, like thoſe of the ſnail kind; and in this manner its languid circulation is carried on.

Each muſcle has double organs of generation, namely, two ovaries to ſerve the purpoſes beſtowed by the female, and two ſeminal veſſels reſembling what are commonly found in the male. Each ovary and each ſeminal veſſel has its own proper canal; by the ovary canal the eggs deſcend to the anus; and there alſo the ſeminal canals ſend their fluids to impregnate them. By which means Nature has contrived to make one animal ſupply the double purpoſes of generation, and that which forms the egg, is capable of impregnating it alſo. The ovaries uſually empty themſelves of their eggs in ſpring, and are repleniſhed again in autumn; a matter that is pretty certain, ſince we generally find them empty in ſummer and full in winter. Their fecundity is aſtoniſhingly great, and wherever any of this tribe breed, they are ſure to be found in almoſt innumerable quantities. And here again we meet with that circumſtance which frequently occurs in animated nature; that is, the more defenceleſs

leſs the animal, the more prolific it will be found in its ſpecies, and that its enemies and deſtroyers are always proportionate to the numerous multiplication of its progeny. In the preſent inſtance, there is not a predatory ſhell-fiſh, but which is an avowed enemy to the bivalved race, and more particularly of the muſcle; all the various ſpecies of crabs, cray-fiſh, &c. purſue and devour them with avidity; but the trochus is their moſt formidable enemy, thouſands of their ſhells are found entirely deſtitute of ſubſtance, and which has evidently been drawn out by the trochus, as in thoſe caſes a ſmall hole is invariably to be perceived in ſome part of the ſhells.

But notwithſtanding the number of this creature's animated enemies, it ſeems ſtill more fearful of the agitations of the element in which it reſides; for if daſhed againſt rocks, or thrown far on the beach, it is deſtroyed without a power of redreſs. In order to guard againſt theſe, which are to this animal the moſt common and the moſt fatal accidents, although it has a power of ſlow motion, yet it endeavours to become ſtationary, and to attach itſelf to any fixed object it happens to be near. For this purpoſe it is furniſhed with a very ſingular capacity of binding itſelf by a number of threads to whatever object it approaches; and theſe Rheaumur ſuppoſes to be ſpun artificially, as ſpiders do their webs, which they faſten againſt a wall. Of this, however, later philoſophers have found very great reaſon to doubt. It is, therefore, ſuppoſed that theſe threads, which are uſually called the beard of the muſcle, are the natural growth of the animal's body, and by no means produced at pleaſure; in which ſuppoſition they ſeem to have ſome warranty, from the great length to which many of thoſe beards arrive, far exceeding that of the body itſelf; and what is ſtill more, they always encreaſe with the growth of the animal. But by whatever means the beard may be produced, nothing is more certain than the muſcle makes uſe of it for the purpoſe of attaching itſelf to ſome object; and if a quantity are thrown into a river where they cannot meet with any rocky ſubſtance, they will even twiſt their threads round each other, and large bunches of them are often taken in that ſituation.

Its inſtrument of motion, by which it contrives to reach the object it wants to bind itſelf to, is that muſcular ſubſtance reſembling a tongue, which is found long in proportion to the ſize of the muſcle. In ſome it is two inches long, in others not a third part of thoſe dimenſions. This the animal has a power of thruſting out of its ſhell; and with this it is capable of making a ſlight furrow in the ſand at the bottom. By means of this furrow it can erect itſelf upon the edge of its ſhell; and thus continuing to make the furrow in proportion as it goes forward, it reaches out its tongue, that anſwers for the purpoſe of an arm, and thus carries the ſhell edgeways, as in a grove, unleſs it reaches the point intended. There, where it determines to keep up its reſidence, it fixes the ends of its beard, which are glutinous, to the rock, or the object, whatever it be; and thus, like a ſhip at anchor, braves all the agitations of the water. Some of them contrive to faſten themſelves by ſeveral of theſe threads; while others make uſe of only three or four, which appear ſcarce able to retain it. Being once ſecurely fixed, the muſcle lives upon the little earthy particles which the water waſhes over its ſhells, and ſome authors ſuppoſe the little animalculæ the water contains. In this manner there have been inſtances of their growing to a foot in length. The beards have been ſeen a foot and an half long; and of this ſubſtance, the natives of Palermo ſometimes make gloves and ſtockings.

Theſe ſhell-fiſh are found in lakes, rivers, and in the ſea. Thoſe of the lake often grow to a very large ſize; but they ſeem a ſolitary animal, and are found generally ſeparate from each other. Thoſe of rivers are not ſo large, but yet in greater abundance; but the ſea muſcle is in moſt plenty. Theſe are often bred artificially in ſalt-water marſhes that are overflowed by the tide; the fiſhermen throwing them in at the proper ſeaſons, and there being undiſturbed by the agitations of the ſea, and not preyed upon by their powerful enemies at the bottom, they caſt their eggs, which ſoon become perfect animals, and theſe are generally found in cluſters of ſeveral dozens together. It requires a year for the peopling a muſcle-bed; ſo that, if the number conſiſts of forty-thouſand, a tenth part may annually be left for the peopling the bed anew. Muſcles are taken from their beds from the month of July to October.

The *oyſter* differs very little from the muſcle, except in the thickneſs of its ſhell, and its greater imbecility. The oyſter, like the muſcle, is formed with organs of life and reſpiration,

tion, with inteſtines which are very voluminous, a liver, lungs, and heart. Like the muſcle, it is ſelf-impregnated; and the ſhell, which the animal ſoon acquires, ſerves it for its future habitation. Like the muſcle, it opens its ſhell to receive the influx of water, and, like that animal, is ſtrongly attached to its ſhells both above and below.

Among the foremoſt of its differences, we may reckon that of the ſhape of the ſhells; thoſe of the muſcle being equally bulged alike, whereas the oyſter has one nearly, if not entirely, flat, the which is from neceſſity always kept upwards, as the other ſerves to hold the water requiſite for its ſubſiſtence. The ſhells are alſo ſo thick and well lined, that they appear perfectly well guarded againſt the attacks of the predatory tribe, and even the trochus will paſs by them, in hopes of obtaining more eaſy prey. From their being perfectly ſtationary, a number of ſmall reptiles cling to their ſhells, as the pipe and little red worms, and where they live in perfect ſecurity. The oyſter is utterly unable to change its ſituation. It is entirely without that tongue which anſwers the purpoſes of an arm in the muſcle; but nevertheleſs is often attached very firmly to any object it happens to approach, whether rocks, ſtones, pieces of timber, or ſea-weeds; nay, nothing is ſo common in the rivers of the tropical climates as to ſee oyſters growing even amidſt the branches of the foreſt. Many trees which grow along the banks of the ſtream, often bend their branches into the water, and particularly the mangrove, which chiefly delights in a moiſt ſituation. To theſe the oyſters hang in cluſters, like apples upon the moſt fertile tree; and in proportion as the weight of the fiſh ſinks the plant into the water, where it ſtill continues growing, the number of oyſters encreaſe, and hang upon the branches. This is effected by means of a glue proper to themſelves, which, when it cements, the joining is as hard as the ſhell, and is as difficultly broken. Sometimes they attach themſelves to the rocks by a kind of threads which grow out of their ſhells.

Oyſters uſually caſt their ſpawn in May, which at firſt appears like drops of candle-greaſe, and ſticks to any hard ſubſtance it falls upon. Theſe are covered with a ſhell in two or three days; and in three years the animal is large enough to be brought to market. As they invariably remain in the places where they are laid, and as they grow without any other ſeeming food than the afflux of ſea-water, it is the cuſtom at Colcheſter, and other parts of England, where the tide ſettles in marſhes on land, to pick up great quantities of ſmall oyſters along the ſhore, which when firſt gathered, ſeldom exceed the ſize of a ſixpence. Theſe are depoſited in beds where the tide comes in, and in two or three years grow to a tolerable ſize. They are ſaid to be better taſted for being thus ſheltered from the agitations of the deep; and a mixture of freſh water entering into theſe repoſitories, is ſaid to improve their flavour, and to encreaſe their growth and fatneſs.

The oyſters, however, which are prepared in this manner, are by no means ſo large as thoſe found ſticking to rocks at the bottom of the ſea, uſually called rock-oyſters. Theſe are ſometimes found as broad as a plate, and are admired by ſome as excellent food. But theſe are trifling compared to the oyſters of the Eaſt-Indies, ſome of whoſe ſhells meaſure two feet over! The oyſters found along the coaſt of Coromandel are capable of furniſhing a plentiful meal for eight or ten men; but it ſeems univerſally agreed that they are no way comparable to ours for delicacy or flavour.

Thus the muſcle and the oyſter appear to have but a few diſtinctions, except in their ſhape, and the power of motion in the former. Other bivalved ſhell-fiſh, ſuch as the *cockle*, the *ſcallop*, and the *razor*-ſhell, have differences equally minute. The power of changing place, which ſome of them effect in a manner quite peculiar to themſelves, makes their greateſt difference.

The *ſcallop* is particularly remarkable for its method of moving forward upon land, or ſwimming upon the ſurface of the water. When this animal finds itſelf deſerted by the tide, it makes very remarkable efforts to regain the water, moving towards the ſea in a moſt ſingular manner. It firſt gapes with its ſhell as widely as it can, the edges being often an inch aſunder, then it ſhuts them with a jerk, and by this the whole animal riſes five or ſix inches from the ground. It thus tumbles any way forward, and then renews the operation until it has attained its journey's end. When in the water it is capable of ſupporting itſelf upon the ſurface; and there opening and ſhutting its ſhells, it tumbles over and over, and makes its way with ſome celerity.

The *pivot*, or *razor-ſhell*, has a very different kind of motion. As the former moves laboriouſly and ſlowly forward, ſo the razor-ſhell has only a power of ſinking point downward. The ſhells of this animal reſemble nothing ſo much as the haft of a razor; and by this form it is better enabled to dive into the ſoft ſand at the bottom. All the motions of this little animal are confined to ſinking or riſing downwards or upwards in the ſand, for it never leaves the ſpot where firſt it was planted. From time to time it is ſeen to riſe about half way out of its hole; but, if any way diſturbed, it ſinks perpendicularly down again. Juſt over the place where the razor buries itſelf, there is a ſmall hole like a chimney, through which the animal breathes, or imbibes the ſea-water. Upon the deſertion of the tide theſe holes are eaſily diſtinguiſhed by the fiſhermen who ſeek for them, and their method of enticing the razor up from the depth of its retreat, is by ſprinkling a little ſea-ſalt upon the hole; this, melting, no ſooner reaches the razor below, than it inſtantly riſes ſtraight upwards, and ſhews about half its length above the ſurface. This appearance, however, is inſtantaneous; and, if the fiſherman does not ſeize the opportunity, the razor immediately ſinks, and buries itſelf at its former depth, nor will any ſalt lure it up again, but there it remains perfectly ſecure, unleſs its purſuer will be at the trouble of digging it out of its retreat, which is frequently more than two feet below the ſurface,

Such are the minute differences between bivalved fiſh: but in the great outlines of their nature they exactly reſemble each other. It is particularly in this claſs of ſhell-fiſh that pearls are found in greateſt abundance; they are ſaid, indeed, to generate in all ſhells whoſe inſides are of a ſhining ſilvery ſubſtance, or what is commonly called mother-of-pearl. It has been a matter of diſpute whether the pearl originated from accident, or a diſeaſe in the animal, and many arguments have been uſed to ſupport the latter opinion; but theſe have been ſo fully anſwered, as to leave no doubt of the pearl being produced by the ſame matter that goes to form the inner part of the ſhell. This ſubſtance, which is ſoft at firſt, quickly hardens, and thus, by ſucceſſive coats, layer over layer, the pearl acquires its dimenſions. If cut through it will be found to conſiſt of ſeveral coats, like an onion; and ſometimes a ſmall ſpeck is ſeen in the middle, upon which the coats were originally formed.

All oyſters, and moſt ſhell-fiſh, are found to contain pearls; but that which particularly obtains the name of the pearl oyſter, has a large ſtrong whitiſh ſhell, wrinkled and rough without, and within ſmooth and of a ſilver colour. From theſe the mother of pearl is taken, which is nothing more than the internal coats of the ſhell reſembling the pearl in colour and conſiſtence.

This however is of very little value, compared with the pearl itſelf, for the obtaining of which there are ſeveral places called pearl fiſheries, both in Aſia and America; thoſe of the latter place have indeed gone much of late into diſuſe; and the principal one now in Aſia is in the Perſian Gulph, near the iſle of Bahren; "where," ſays Goldſmith, "the wretched people that are deſ-
" tined to fiſh for pearls, are either negroes, or
" ſome of the pooreſt of the natives of Perſia.
" The divers are not only ſubject to the dan-
" gers of the deep, to tempeſts, to ſuffocation
" at the bottom, to being devoured by ſharks,
" but from their profeſſion univerſally labour
" under a ſpitting of blood, occaſioned by the
" preſſure of air upon their lungs in going down
" to the bottom. The moſt robuſt and healthy
" young men are choſen for this employment,
" but

"but they ſeldom ſurvive it five or ſix years. "Their fibres become rigid; their eye-balls "turn red; and they uſually die conſumptive.

"It is amazing how long they are ſeen to "continue at the bottom. Some, as we are "aſſured, have been known to continue three "quarters of an hour under water without "breathing, and to one unuſed to diving, ten "minutes would ſuffocate the ſtrongeſt. They "fiſh for pearls, or rather the oyſters that con"tain them, in boats twenty-eight feet long; "and of theſe there are ſometimes three or four "hundred at a time, with each ſeven or eight "ſtones, which ſerve for anchors. There are "from five to eight divers belonging to each, "that dive one after another. They are quite "naked, except that they have a net hanging "down from the neck to put their oyſters in, "and gloves on their hands to defend them "while they pick the oyſters from the holes in "the rocks; for in this manner alone can they "be gathered. Every diver is ſunk by means "of a ſtone, weighing fifty pounds, tied to the "rope by which he deſcends. He places his "foot in a kind of ſtirrup, and laying hold of "the rope with his left hand, with his right "he ſtops his noſe to keep in his breath, as in

“ going down he takes in a very long inſpiration. When at the bottom, they give a ſignal to thoſe in the boat to draw up the ſtone; which done, they go to work, filling their net as faſt as they can; and then giving another ſignal, the boats above pull up the net loaded with oyſters, and ſhortly after the diver himſelf, to take a new inſpiration. All the oyſters are brought on ſhore, where they are laid in a great heap till the pearl fiſhery is over, which continues during the months of November and December.”

The fiſhing-ſeaſon being over, they then examine every oyſter for the pearls, but they are not always alike ſucceſsful, for ſome ſeaſons turn out infinitely more advantageous than others, not entirely ariſing from the numbers they obtain, but from their value, which encreaſes not only in proportion to their ſize, but alſo in their figure and colour; ſome are found of an oblong, others nearly round; ſome are white, others have a yellowiſh ſhade, others are of a led colour, and ſome though very rarely, are met with as black as jet.

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*END OF THE FOURTH VOLUME.*